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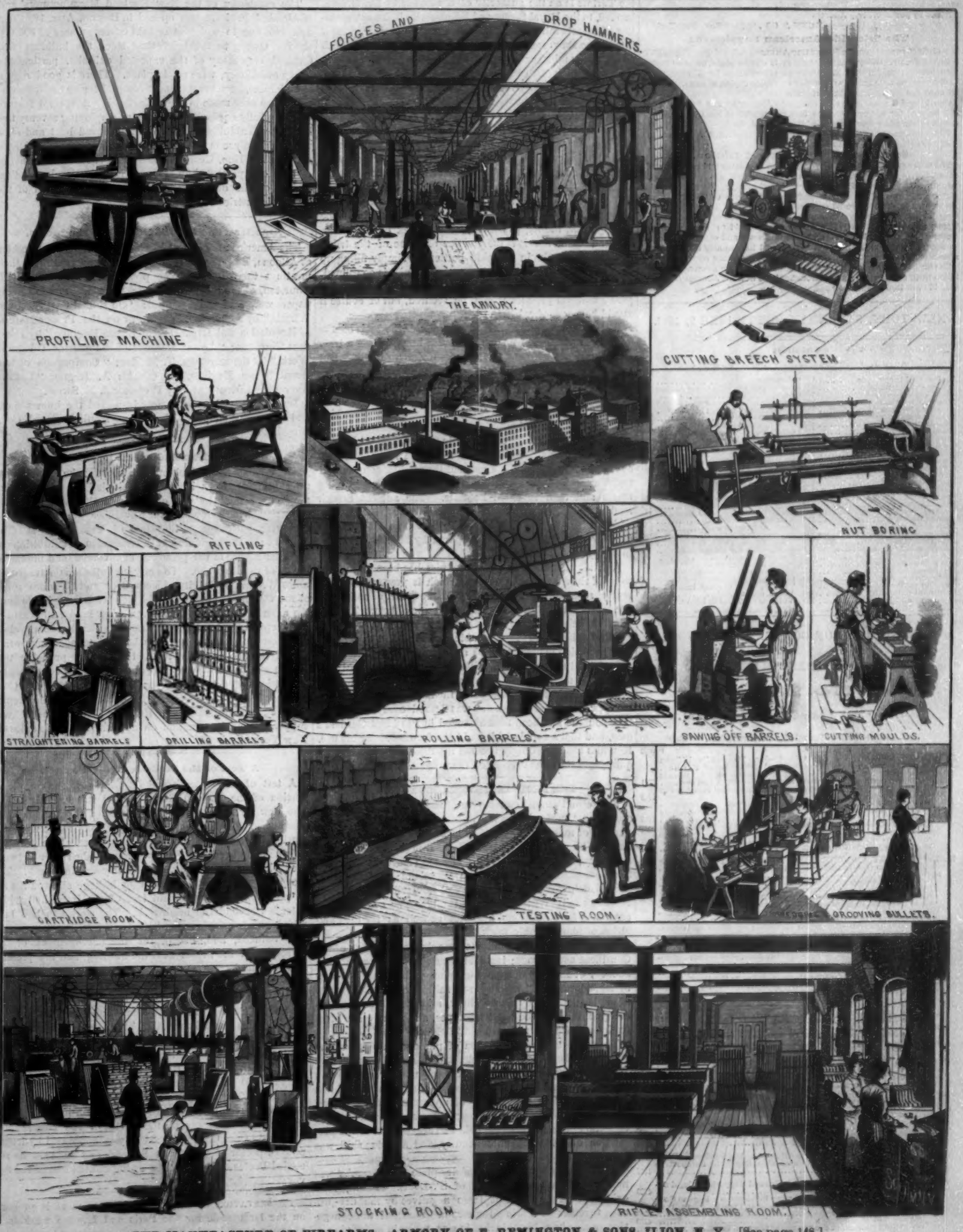

THE MANUFACTURE OF FIREARMS.—ARMORY OF E. REMINGTON & SONS, ILION, N. Y. [See page 148.]

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NEW YORK, SATURDAY, SEPTEMBER 3, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 296,

For the Week ending September 3, 1881.

Price 10 cents. For sale by all newsdealers.

KOUMISS.

The Tartars and some other equestrian tribes, from time immemorial it is said, have practiced the art of brewing a sort of beer from mare's milk; and in later times they have learned how to distill this beer and procure from it a very potent brandy. Koumiss is the native name of the mare's milk beer, and rack or racky of the koumiss brandy. This koumiss has at times become celebrated among enlightened people as a health reviver—a fact, by the way, not at all extraordinary, and not necessarily dependent upon any good quality of the koumiss. The regular doctors and the standard medicines fail us so often that we must not be too severe on the afflicted, who, in their despair, resort to quacks and the outlandish devices of the barbarians.

The following account of the preparation of koumiss by the Tartars is on the authority of a memoir by Dr. Grieve, in 1788, to the Royal Society of Edinburgh. Take any quantity of mare's milk, dilute it with a sixth of water, pour it into a wooden vessel, and add as a ferment about one-eighth of very sour milk, or better, of old koumiss; cover the vessel with a thick cloth and keep it at a moderate temperature. After standing twenty-four hours, a thick coagulum rises to the top, which must be well mixed in by beating and churning. After reposing for another day, it is again stirred till it becomes quite homogeneous, and in this state it forms the new koumiss, which has an agreeable sweetish acescent taste. Koumiss, keeps well, and, like other beers and wines, with proper care, improves with age in taste and becomes more alcoholic.

It is often preserved and transported in bottles made from horse skin; a complete bottle is made from the skin of the hind quarter, the leg part forming the neck of the bottle. We understand that it is the practice of some of the tribes to prepare koumiss in the skin bottles by simply filling up the bottle with fresh milk as fast as the koumiss is consumed. If the rate of using and filling up be properly regulated, a pretty uniform product would be secured, but of course it would be a sort of "'alf and 'alf."

It is to be understood that mare's milk is the basis of the genuine koumiss, and no doubt genuine koumiss has a taste and odor peculiar to and characteristic of mare's milk. But as to chemical constitution, there is very little difference between mare's milk and that of other large mammals, and any kind of milk will produce koumiss closely resembling the genuine; perhaps cow's milk will produce a koumiss which will surpass the genuine. The Tartars use mare's milk because of the abundance of horses in comparison with other available milk-giving animals. Horses and Tartars have been constant companions for ages, and thus it has come about that Tartars became experts in the difficult art of milking mares and then invented koumiss. The ancient Scotch made a fermented drink out of milk, but not mare's milk, which it is proper to allude to here. The basis of the Scotch drink was whey, which was prepared by keeping it buried in the ground, undisturbed, for at least a year.

A drink under the name of koumiss has been on sale in some of the saloons of this city, which is prepared from a receipt substantially as follows: To one quart of milk add one tablespoonful of sugar and the same of brewer's yeast; when sufficiently fermented, preserve in strong bottles.

Wine whey, and innumerable punches, and Tom-and-Jerries, which contain milk as an essential ingredient, also are related to koumiss. And there are those, constantly increasing in number, who do not allow that milk can be improved for any useful purpose by the addition of alcohol.

A few days since the news was flashed over the country that koumiss had been recommended in President Garfield's case, and that a supply of it had been forwarded for his use. Koumiss has accordingly become a subject of extensive inquiry, and thus has originated the present article.

THE PHOTOGRAPHERS' CONVENTION.

The second annual convention of the Photographic Association of America began in this city August 15, with a large number of members present. The officers were: John Carbutt, of St. Louis, President; G. A. Douglass, of Chicago, Secretary; and A. Hesler, of Chicago, Treasurer. Executive Committee—J. T. Ryder, of Cleveland; E. L. Wilson, of Philadelphia; and H. Klauber, of Louisville. The Local Secretary is L. W. Seavey, of this city. The association is organized for educational purposes as well as for the exhibition of photographic work.

Among the exhibits were photographs from all parts of the Continent and Europe; instantaneous ones by Sergeant Van Sochen, U.S.A.; vessels photographed while being blown up by torpedoes, and steamboats and sailing craft taken while in motion; photos by electric light, microscopic and magnified photographs, old daguerreotypes, and many other illustrations of the art, new and old.

There was also an exhibition of photographic apparatus and materials, some very excellent displays being made by Western manufacturers; but for some unexplained reason the principal makers in this city did not take any prominent part in the affair; the display of apparatus was, therefore, not as great as it might have been. There was an interesting collection of scenic backgrounds and accessories, in the production of which much ingenuity and artistic skill was evinced.

Quite a remarkable exhibit of dry-plate photography was made by Cramer & Norden, of St. Louis. Among their exhibits were a number of large negatives by the dry-process, together with prints therefrom. Some of these negatives were about 18x20 inches in size, taken in gallery in one second, representing large portraits, wedding groups, etc. One picture, 10x12, taken by an electric light in six seconds, represented a supper room, with table all spread ready for the guests—a fine picture.

During the exhibition several different improved photo processes were practically tested. The superior convenience and success of the new rapid gelatine and emulsion processes were fully demonstrated, many excellent pictures being produced. The wet process was also worked; but on the whole it was pretty conclusively shown that the dry process is the photographic art of the future.

The exhibition was held in the rooms of the American Institute, 63d street and Third avenue.

New England Industrial Exhibition.

The exhibition of the New England Manufacturers' and Mechanics' Institute was opened in Boston, Aug. 18. The new building in which it is held covers an area of 300,000 sq. ft. Owing to the brief time since the building was finished, very many of the expected exhibits, particularly heavy machinery, were not in place. There is good reason to anticipate, however, the most comprehensive and valuable exhibition ever made in New England. A special feature will be a fully equipped shoe factory employing seventy-five hands, and exhibiting all the most approved boot and shoe machinery in use in the United States. The opening address, delivered by Hon. George B Loving, U. S. Commissioner of Agriculture, presented an eloquent historical and statistical review of the development and present condition of the leading industries of the country.

American Society of Mechanical Engineers.

The American Society of Mechanical Engineers assembled at Altoona, Pa., on the 10th of August, and continued their meetings three days. The president, Professor R. H. Thurston, of the Stevens Institute, presided. The following papers were read and discussed: "On Rolled Cast Steel Car Wheels," by Jacob Reese; "Notes on the Proper Method of Regulation and Expansion in Steam Engines," by President Thurston; "Latest Methods of Submarine Telegraph Work," by the secretary, T. M. Rae; "Comparison of Different Steam Engines," by Charles A. Hague: "Coffin's Averaging Instrument," by Professor J. E. Sweet.

During the session the society inspected the immense car and locomotive shops of the Pennsylvania Railroad Company in Altoona.

The Mexican Industrial Exposition.

The celerity with which our neighbors of the Montezumas are adopting modern ideas and habits is indicated to a very gratifying extent by the coming scientific and industrial show that will be opened in November next at Orizaba, under the patronage of the state of Vera Cruz. It is intended to be the beginning of a succession of exhibitions of a similar nature in the principal commercial and industrial towns of the Republic. The city of Orizaba is situated 70 miles W.S.W. of the city of Vera Cruz and 25 miles south of the volcano of Orizaba. The vicinity is very fertile, and the town is beautifully located on high land and is said to be exceptionally healthy. There are extensive coarse cloth and cotton spinning factories, besides tobacco and other manufacturing industries in the town. It is probable that as the exhibition approaches, and during its continuance, concessions in freight and passenger rates to Vera Cruz will be offered, while all goods for exhibition will be exempt from custom duties. The Mexican Consul-General will supply further information on application at his office in New York city.

A Test of the Hudson River Tunnel.

A test of the strength and soundness of the completed portion of the Hudson River Tunnel was recently made. The new air locks at the river ends of the borings were closed and the air pressure was gradually reduced in the portion between the locks and the shore. The test was satisfactorily borne, except by the unfinished part between the locks and the heading, about thirty feet in length. The escape of air from this portion by leakage allowed the silt to press in, crushing several feet of the iron shell which extended beyond the brickwork. The workmen had been withdrawn from this part of the tunnel before the pressure was reduced, and, except for the derangement of the extremity of the tunnel next the heading, and the pressing in of silt, no harm was done.

Carlisle Pollock Patterson.

Captain Carlisle P. Patterson, Superintendent of the United States Coast Survey, died at his residence near Washington, August 15. He was born in Louisiana, August 24, 1816, and was the son of the late Commodore D. T. Patterson, of the U. S. Navy. He was appointed midshipman in the navy in 1830. His connection with the Coast Survey began in 1838. After three years' service, he returned to duty in the navy, but joined the Coast Survey again in 1845. From 1849 until 1853 he was in the service of the Pacific Mail Steamship Company. In 1864 he was appointed hydrographic Inspector of the Coast Survey, and in 1874 he succeeded Professor Benj. Peirce as Superintendent of the Survey.

PRESERVATION OF MEAT.—In Vienna meat is prepared on the large scale for the Paris and London markets by exposure to cold and treatment with powdered borax.

STEAM-BOILER NOTES.

There are at this day but few industries that do not involve the use of the steam boiler, and almost every person of a modern community is interested in its safe use. But how is its fitness for use to be determined? At this time there should be a method unanimously agreed on by all who are intrusted with the construction and management of them. Yet uncertainty exists, and must increase while no rule or law is set up to control the construction and management of them.

The demand is now very brisk for new boilers; those in use, tens of thousands of them, are undergoing deterioration at various rates. New ones of uncertain strength are taking the places of condemned ones, or being added to the systems already existing. It will perhaps appear to the old engineer who has never met with an accident, plain enough how to select and manage a boiler for a given duty to his own satisfaction, but what assurance have those about him that he may not soon or late be mistaken and come to grief as others have done?

Mr. Barnet Le Van, in the *Franklin Institute Journal*, says: "A cast iron boiler head only 2 inches thick would not be considered by an experienced engineer strong enough for a cylinder boiler 36 inches in diameter," and he recites the damage and loss of life occasioned by the blowing out of such a head at the Gaffney dye works (so much talked about), that had been duly inspected by a steam boiler insurance company, whose inspector he censures by implication because he passed this head without comment, while his own testimony was that his experience had taught him that other forms were stronger than this. It appears, however, that the experience of that same inspector had also taught him that the head in question was strong enough for the pressure allowed, but not for the accidental excessive pressure that occurred at noon, with all the steam valves closed and the safety valves inoperative. This was the cause of the boiler giving out at its weakest place, as its model did when tested by the Philadelphia city inspector to five times the pressure allowed on the head in question.

There was a remarkable explosion of a new and peculiar steam boiler at Pawtucket, R. I., on the 2d of August, at the coal and wood stores of S. Grant & Co., when the fireman, who was in the act of ripping a plank at a neighboring saw bench, was blown forty feet and instantly killed. The boiler was of the "union" or double cylinder tubular type of peculiar construction—two parallel cylinders, one above the other, joined by three large necks, the peculiarity being that each end plate serves as a head common to both cylinders, and also as a cover to the outer side of the end necks. It is locally known as the compound tubular boiler, and made by the Central Falls Steam Boiler Works, R. I. The lower cylinder of the sample now under consideration was filled with tubes, and was 42 inches diameter, and the upper one 26 inches diameter (no tubes), both 10 feet long. The boiler was set in brick walls and externally fired, the steam being used at a pressure of about 75 to 90 lb. per square inch for driving a number of hoisting and sawing machines.

In the portion of the front head covering the end of the smaller cylinder there was a man-hole of the usual size, the opening strengthened by a wrought iron ring, 1 inch by 3 inches, riveted to the head. There was also an angle iron, 4 inches by ⅜ inch, riveted across the head below the man-hole. The head was called seven-sixteenths thick, but was slightly less. The remarkable thing about this explosion was that this apparently strong wrought iron head broke along the flange angle of the portion covering the small cylinder and along the line of the upper row of tubes, and blew out, followed by the fluid contents of the boiler, without causing sufficient recoil to break the brickwork or injure the chimney at the other end. The fire front, which extended as high as the top of the boiler, was of course blown down. The upper portion of the head, as above described, opened by turning on its left-hand border, and flew almost directly to the front, a distance of about 40 feet, where the fireman was also found, dead.

The boiler having been taken away for repairs, an interview was had with one of the proprietors of the coal stores, who was asked why this form of boiler, which is more costly than a like power in the simpler form of plain cylinder tubular, had been decided on when the purchase was made. The answer came promptly and decidedly, that the new style of boiler had proved itself, not by experimental tests of a few hours' duration under the direction of experts, but by continuous working tests in many of the factories in Rhode Island and Lowell, Mass., to be the most economical steam generator known to the firm. And they have seen that the difference in cost is a good investment, having had nearly two years' trial of this sample. It starts quickly and maintains a steady supply of dry steam. An examination of the features that characterize this as an economical boiler shows that they are the large and deep furnace, whereby perfect combustion of the fuel is effected, and the large ratio of effective heating surface, the gases traversing three times the length of the boiler, reaching the chimney at the rear after passing in contact with the lower half of the upper cylinder. The chimney is thus located at the most desirable end of the boiler, which is an incidental convenience.

The peculiarity of this accident naturally draws attention to the quality of the iron. Pieces of the broken head were therefore subjected to practical tests of bending, both cold and hot, which showed that it was of the best quality of flange iron. A strong company has just been organized for the manufacture of these boilers, and large orders are on their books from such firms as the Providence Machine Company, 200 horse power, and Green, Daniels & Co., 500 horse power The New England Mechanics' Institute and the Atlanta Cotton Exposition are to be furnished with them.

The frequent disastrous explosions of steam and hot water vessels that are detached from the steam generator or beyond the reach of the direct action of the fire from which they receive their heat, seem to leave no foundation for any of the theories that are founded on repulsion, overheating, and low water, and especially is this true of cylinders that are kept revolving while in use, such as paper stock bleachers, drying cylinders, and the like. A case in a dyehouse on Staten Island, which was illustrated in the SCIENTIFIC AMERICAN of August 6, 1881, is a case of the latter sort, and had the cylinder been stronger, so as to allow of the accumulation of a higher pressure, the effect would have been proportionally enhanced. As it was, however, the phenomena were precisely similar to those which attend mild boiler explosions, which generally occur from excessive weakness and at low pressures.

The Staten Island cylinder was quite 150 feet from any fire, and all its heat had to pass through a half-inch steam pipe, a branch from a larger pipe, and it burst while in motion, precluding all possibility of motionless water, from which a superheated or an unequally heated condition of the contents could arise. Moreover, there was no outlet valve or other means of suddenly reducing the pressure, as in case of starting an engine after an interval of rest, thereby producing violent commotion in the water sufficient to break the boiler. It must occur to all thoughtful engineers whose attention is drawn to this subject, that a boiler must be weak and almost at the point of yielding when the shock resulting from opening the throttle valve would be sufficient to blow up the boiler. A fact in this connection is called to mind of a marine engine that was fitted with a butterfly throttle valve which could be opened in the quickest possible manner to the full capacity of a 12-inch steam pipe. The engine being of the inverted vertical type, driving a screw of 14 feet diameter, had an annoying habit of stopping on the lower dead center, unless handled with great caution and with skill derived from practice with this particular engine, and it was therefore fitted, after several years' use, with a set of by-pass valves, for starting and stopping, which admitted steam into the passages between the steam chest and the cylinder cavity. These being small puppet valves were easily handled, while the throttle was closed, for starting and stopping the engine. The habit then was to set the engine in motion with these small valves, and then suddenly open the main valve to its full-open point. This habit prevailed as long as the ship was under the writer's observation, and the operation was repeated sometimes many times daily, with steam in the boilers often above the working pressure. The boilers were at last condemned on account of weakness from corroded water bottoms, but the shocks caused by opening this 12-inch valve had never proved sufficient to cause any damage to the boilers. They were carefully watched, and an ample safety margin existed till condemned on account of inevitable deterioration.

A thousand, perhaps many thousand, cases of suddenly opening wide steam passages might be cited where no damage resulted, for every one that has caused explosion or to which explosion could possibly be attributed by the most ardent advocate of this theory, because boilers in their normal condition are capable of safely enduring such shocks.

Many cases of rotary bleaching cylinder explosions are on record. They are usually from 5 to 8 feet diameter and about 20 feet long, made of wrought iron or steel plates, to which are fitted heads of sufficient strength of various constructions, now preferably of a single dished wrought iron or steel plates fitted with hollow cast iron flanged gudgeons, through which steam is admitted, while they support the revolving cylinder upon journal bearings. These cylinders are charged with several tons of paper rags or other stock, and bleaching liquid and steam, usually from 40 to 60 pounds pressure, is turned in to boil and bleach the stock.

When these cylinders become too weak to endure the pressure they give way, and the contents practically explode, and the results are precisely similar to those produced by boilers of similar size. But to all such cases no other theory than weakness is applicable, though they are torn and thrown just as boilers are sometimes on the blowing out of the head, and sometimes on the bursting of the shell.

A singular dogma has lately been promulgated by somebody to the effect that a weak or poorly constructed boiler is safer at a high pressure in the charge of an intelligent engineer than a strong and well constructed one in the hands of a reckless and ignorant man at far less pressure. This statement has just the least tinge of superstition as regards the effect of intelligence on the strength of material, and should be accompanied by an explanation, which would probably amount to this: that the intelligent engineer having such a boiler in his charge would immediately stop it and take measures to render it safe, which, no doubt, the ignorant man would also do if told of his danger by the intelligent one. Two hundred pounds of intelligence are just as heavy on weak ice as the same avoirdupois of ignorance, but the wise man might perhaps cross safely where the fool would blunder into an air hole or stamp himself through.

A Volcano Reported in Idaho.

An unconfirmed dispatch from Lewiston, Idaho, states that a well marked volcanic eruption occurred about twenty miles east of Mount Idaho, south of the south fork of the Clearwater, August 9. The eruption was said to be plainly visible from Camas Prairie, the column of fire and smoke rising several hundred feet. The surrounding country is volcanic in character, but no signs of activity have before been noted.

JAPANNING AND JAPANS.

When finished wood, papier-mâché, composition, or metals are varnished in the usual manner and left to dry in the air the drying is in most cases imperfect, and the coating more or less uneven. If the surface thus varnished is heated for some time to a temperature of from 250° to 300° Fah. or higher, it is found that the whole of the solvent or vehicle of the gums or resins in the varnish is soon driven off, and the gummy residue becomes liquefied or semi-liquefied, in which state it adapts itself to all inequalities, and if the coating is thick enough presents a uniform glossy surface, which it retains on cooling. This process of drying out and fusion secures a firm contact and adhesion of the gums or resins to the surface of the substance varnished, and greatly increases the density of the coating, which enables it to resist wear and retain its gloss longer.

This process of hardening and finishing varnished or lacquered work by the aid of heat constitutes the chief feature of the japanner's art.

In practice the work to be japanned is first thoroughly cleansed and dried. If of wood, composition, or other porous material it is given while warm several coats of wood-filler, or whiting mixed up with a rather thin glue size, and is, when this is hardened, rubbed down smooth with pumice stone. It is then ready for the japan grounds. Metals as a rule require no special preparation, receiving the grounds directly on the clean dry surface.

In japanning, wood and similar substances require a much lower degree of heat and usually a longer exposure in the oven than metals, and again a higher temperature may be advantageously employed where the japan is dark than when light-colored grounds are used; so that a definite knowledge of just how much heat can be safely applied and how long an exposure is required with different substances and different grounds can only be acquired by practical experience.

The japanner's oven is usually a room or large box constructed of sheet metal, and heated by stove drums or flues, so that the temperature—which is indicated by a thermometer or pyrometer hung up inside, or with its stem passing through the side wall midway between the top and bottom of the chamber—can be readily regulated by dampers. The ovens are also provided with a chimney to carry off the vapors derived from the drying varnish, a small door through which the work can be entered and removed, and wire shelves and hooks for its support in the chamber. The ovens must be kept perfectly free from dust, smoke, and moisture.

A good cheap priming varnish for work to be japanned consists of:

Shellac (pale)	2 ounces.
Rosin (pale)	2 "
Rectified spirit	1 pint.

Two or three coats of this is put on the work in a warm dry room. A good black ground is prepared by grinding fine ivory black with a sufficient quantity of alcoholic shellac varnish on a stone slab with a muller until a perfectly smooth black varnish is obtained. If other colors are required the clear varnish is mixed and ground with the proper quantity of suitable pigments in a similar manner: for red, vermilion or Indian red; green, chrome green or prussian blue and chrome yellow; blue, prussian blue, ultramarine, or indigo; yellow, chrome yellow, etc. But black is the hue commonly required. The following are good common black grounds:

1. Asphaltum	1 pound.
Balsam of capivi	1 "
Oil of turpentine	q. s.

The asphaltum is melted over a fire, and the balsam, previously heated, is mixed in with it. The mixture is then removed from fire and mixed with the turpentine.

2. Moisten good lampblack with oil of turpentine, and grind it very fine with a muller on a stone plate. Then add a sufficient quantity of ordinary copal varnish and rub well together.

3. Asphaltum	3 ounces.
Boiled oil	4 quarts.
Burnt umber	8 ounces.
Oil of turpentine	q. s.

Melt the asphaltum, stir in the oil, previously heated, then the umber, and when cooling thin down with the oil of turpentine.

An extra fine black is prepared from:

Amber	12 ounces.
Asphaltum (purified)	3 "
Boiled oil	½ pint.
Resin	3 ounces.
Oil of turpentine	16 "

Fuse the gum and resin and asphaltum, add the hot oil, stir well together, and when cooling add the turpentine.

A white ground is prepared from copal varnish and zinc white or starch. Large japanners seldom make their own varnishes, as they can procure them more cheaply from the varnish maker.

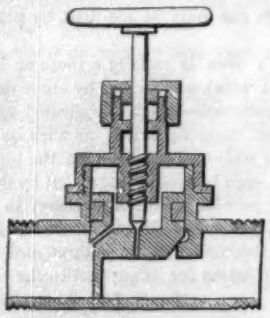
From one to six or more coats of varnish are applied to the work in japanning, each coat being hardened in the oven before the next is put on. The last coat in colored work is usually of clear varnish, without coloring matters, and is in fine work sometimes finished with rotten stone and chamois. For ordinary work the gloss developed in the oven under favorable conditions is sufficient.

Rapid Transit Then and Now.

In the beginning of 1846, when a Broadway elevated railroad was discussed and illustrated in the SCIENTIFIC AMERICAN, it probably seemed extravagant to suggest hourly trains on a single track in Broadway. The most active imagination would scarcely have gone beyond the prediction that half-hourly trains on a double track would be required. Now what do we see? Four double lines, comprising 32 miles of elevated track, on which are run an aggregate of over 3,000 daily trains, as shown by the inventory of property of the Manhattan Elevated Railway Company. It appears that to carry on this enormous traffic 200 locomotives and 600 cars are used, which stop at 161 stations, the force employed being about 3,000 men, whose pay exceeds $5,500 per day. As many as 274,000 persons have been carried in a single day, who paid in the neighborhood of $18,000 for the accommodation.

AUTOMATIC VALVE.

The large valve is packed to fit a cylinder, in which it is capable of moving to and from the valve seat. The central part of one surface of this large valve closes the outlet passage, and the entire annular portion around it is acted upon equally by the pressure of the fluid. A small passage is formed through the annular portion of this large valve to a chamber above or on the passage of this valve to its seat, so that the pressure of the fluid in the chamber, acting on the opposite surface of the large valve, will have a tendency to keep the valve closed. A second somewhat larger passage is formed through the large valve, and is provided with a small valve, on raising which for the escape of the fluid in the chamber, the pressure of the fluid within becomes reduced, and the large valve opens by the pressure of the supply on the annular surface, and the large valve remains open till the small valve is restored to its seat to close the larger passage through the large valve, when, by the pressure of the fluid in the valve chamber being restored, the large valve will close.



DENNIS' IMPROVED VALVE.

This invention was lately patented in England by Mr. Thomas H. P. Dennis, Chelmsford, and Mansion House Buildings, Queen Victoria street, London.

NOVEL MOTOR FOR FAN BLOWERS.

We give an engraving of an improved motor for fan blowers for smelters, founders, forges, dry houses, ventilation, removing dust and shavings, elevating grain and other materials, and for all other purposes requiring a fan blower. It is complete, simple, self-contained, requiring no special foundation, and dispenses with belts, countershafts, and other expensive machinery.

The motor wheel—consisting of a disk having peculiar shaped floats or vanes around its periphery—is secured directly to the blower shaft, and is rotated by the impact of one or more steam jets controlled by suitable valves.

This form of engine may appear wasteful of steam, but the inventor informs us that the results are quite the reverse, and that where a great velocity is required, as in the case of a fan blower, this motor has taken the preference wherever tried, not only on account of its economy in the use of steam, but also on the score of cheapness and great simplicity. It is at present in use in some of our largest factories, hospitals, and public buildings, giving great satisfaction. It is also used on steamboats, and in a variety of other situations.

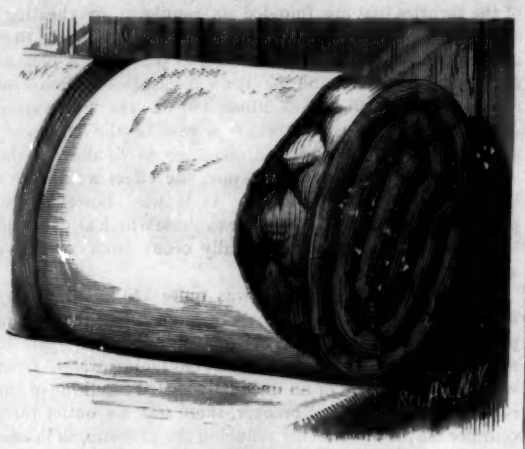
It finds an extensive application in burning cheap coal, insuring perfect combustion, and requiring but 10 lb. of steam pressure to operate it.

The attachment for elevating grain is shown in Fig. 2. In this device the grain is handled on the ejector principle, the discharge pipe of the blower being divided to the box, and the grain falling from the hopper into the space thus made is carried forward by the blast. There is an automatic device for controlling the flow of grain to the elevator tube, so that when the quantity falling from the hopper becomes greater than the blast will carry away, the grain supply is partly cut off.

This invention has been patented by Mr. Thomas Wise, of South Framingham, Mass., who should be addressed for further information.

IMPROVEMENT IN PILLOWS AND BOLSTERS.

The object of the invention shown in the engraving is to prevent the stuffing of pillows and bolsters from being



DOREMUS' IMPROVED PILLOW.

crowded out of place when the said pillows and bolsters are in use.

The pillow or bolster is made by rolling a thin cushion formed of a layer of stuffing and one or two layers of cloth spirally into cylindrical shape. By this device the stuffing is kept from being crowded out of place by use.

The tick is made in the form of a thin bag, provided with a thin layer of stuffing. The cushion thus formed is then rolled spirally into a cylindrical form, and the outer edge of the rolled cushion is secured to the body of the cushion by sewing or other suitable means. This construction is used when feathers or other substances that move easily out of place are used for the stuffing.

The pillows or bolsters can be made by spreading a layer of hair, moss, cotton, or other suitable substance, upon a sheet of cloth of the proper size, and then rolling the stuffing and cloth spirally into a cylindrical form, and securing the edge of the cloth to its body by sewing or other suitable means. This construction, when practicable, is preferred to the other from the fact that it does not bring two layers or thicknesses of cloth in contact with each other, as is the case with the construction first described.

This invention was lately patented by Mr. William T. Doremus, of New York city.

Substrata for Photographic Plates.

BY CAPT. ABNEY, R.E., F.R.S.

Place, say, 50 grains of gelatine in a flask, and add to them a little acetic acid (it is not necessary for it to be glacial); warm in boiling water to dissolve the gelatine. Keep adding acetic acid till solution is secured. It is not very particular how much you add, so long as it is sufficient. When dissolved, make up to about 5 oz. with ordinary methylated spirit. At first the solution remains opalescent while the alcohol is added, but at a well-marked point it becomes white, due to the precipitation of the gelatine. No more spirit must be added at this stage, but more acetic acid must be dropped in till the white curdy appearance is lost. The liquid should be heated to aid the resolution. A grain of chrome-alum dissolved in 1 dr. of water must next be added. You then have a fluid which, when poured upon a glass plate, gives a most excellent substratum. To use it, filter through paper, and coat the plate as with collodion; return the excess into the filter; rock the plate to do away with lines, and dry over a Bunsen burner or a spirit lamp, or before a fire. The alcohol will rapidly evaporate, and then the acetic acid is driven off, and a glassy, hard substratum remains on the surface of the plate. The rapid drying prevents any dust falling on the plate and being embedded in the substratum.

My chief reason in writing on this substratum is to call attention to the admirable way it is adapted to ordinary collodion dry plate methods. Collodion plates which have received a coating of aqueous substrata are always liable to have markings in them, however carefully prepared. Comet-like markings are, for instance, often met with. I recollect perfectly well the difficulty we had to get plates free from this defect during the transit of Venus photography. Had the above been known, much difficulty would have been avoided. With collodion emulsion plates, when a preservative of albumen mixed with other substances was used, it was very difficult to find a substratum which would hold at all. Now we have one which is perfect, and gives no markings.

In the wet process where a substratum is used, or in bath dry plates where development takes place by means of deposition of silver from silver nitrate, the faults in it are not so apparent, since the image is chiefly formed on the surface of the film of collodion. Where alkaline development is used, any defect in the substratum is at once apparent. My remarks not only apply to home-made plates, but also to plates which were supplied commercially before the advent of gelatine plates.

The substratum may also be used as a preservative for collodion dry plates; undiluted and unbromized developers can be used with such. Before applying the preservative, the plate after washing (if washed) should be dipped in methylated spirit and water (5 to 2) in order to make the gelatine solution flow.—*Photo. News.*

NEW FRUIT PRESS.

The engraving shows a very simple and useful press for household use, recently patented by Felicie F. N. Marais, of

NOVEL FRUIT PRESS.

49 West 25th street, New York city. This press consists of a perforated cylindrical vessel, supported upon legs, and provided with a plunger fitting loosely in the vessel, and provided with a cross handle by which it can be moved vertically and rotated.

This press is made on correct mechanical principles, as it admits of bringing a great pressure on a small area, and the leverage of the handle permits of giving the plunger a rotating motion which facilitates the operation of the press.

NEW INVENTIONS.

Mr. Abraham Harrison, of Brenham, Texas, has patented an improved cloth register to be set in a store counter, for the purpose of registering or indicating the number of yards of goods measured. These indicators may be made to indicate the measuring of any number of yards of material, or numbers relating to other measures and weights, by increasing the diameter of the drum or by some other equivalent device, and fractions of numbers as well as whole numbers may be indicated.

Mr. Francis M. Kimes, of Van Buren, Ark., has patented an improved cotton planter so constructed that it can be easily and quickly adjusted for planting cotton seed and cultivating cotton, and which shall be convenient and reliable in either capacity.

An improved rice separator has been patented by Mr. Alonzo Moore, of Bangkok, Siam. The improvements relate to machines for separating unhulled grains from hulled rice, chaff, stones, sticks, and other foreign matter from grain and seed. It consists in a combination of screens and other devices forming an oscillating separator.

Mr. John F. Hornberger, of Lawrenceburg, Ind., has patented an improved rocking crib pivoted to two end standards, one or both of which are provided with a spiral clock spring with winding attachments, a crank on the central pin or shaft of this spring being detachably connected by a suitable connecting rod with the crib and by another connecting

Fig 1

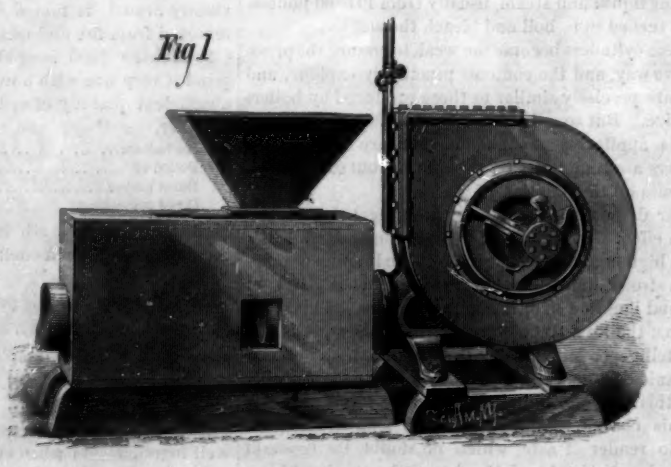
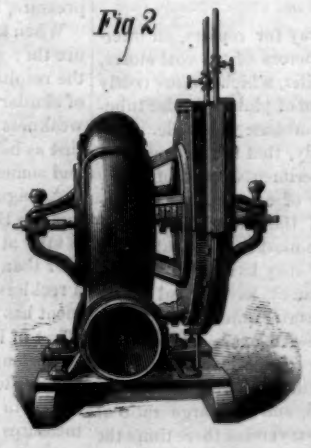


Fig 2



WISE'S STEAM FAN BLOWER.

rod with an opposite crank of a rod journaled in the top of the standards, and having an adjustable fan with spring catches mounted thereon, so that the uncoiling of the clock spring rocks the crib and swings the fan.

An improvement in that class of portable sawing machines which are used for sawing in the woods or fields, and are adapted to be readily moved from place to place, has been patented by Mr. Edwin R. Hill, of Rush River, Wis.

An improved trace holder, patented by Mr. William K. Hardenbrook, of Albia, Iowa, is an improvement on the trace holder for which Letters Patent No. 198,295 were granted to the same inventor December 18, 1877.

Mr. Samuel M. Coop, of Girard, Ill., has patented an improved portable fence with panels having braces hinged to the upper parts of their uprights by pins for holding the panels erect, and having uprights and interposed spacing blocks attached to the end upright of each panel to receive the end of an adjacent panel.

An improved sleigh bolster has been patented by Mr. Herbert L. Steele, of East Bloomfield, N. J. The object of this invention is to render a sleigh less liable to upset, and to make it run more easily with less wear on the box. The invention is especially designed for bob sleighs; and it consists of a rear bolster whose ends are held in slotted blocks that are secured upon the raves of the sleigh, whereby the bolster is brought nearer the raves than in the ordinary construction, thus rendering the sleigh less liable to upset, and is kept at a fixed distance from the front bolster, and whereby the rear bob is free to rise and fall over inequalities in the road without moving its bolster back and forth.

An improved churn has been patented by Mr. Jacob Gelhart, of Atwater, O. This invention relates to rotary churns, and it consists in certain details of construction which cannot be clearly described without engravings.

Mr. Albert Bee Carson, of Papinsville, Mo., has patented an improved safety pocket which can neither be picked nor cut open without the knowledge of the wearer, and which may be put in the place of the ordinary pockets in coats, vests, pantaloons, or other articles of wearing apparel. The invention consists in a pocket having a mouthpiece consisting of two plates of steel or other suitable material, the main or back plate having its extremities slotted and bent upon itself, and the front plate having its extremities fitted to slide in the slots of said back plate, and provided with T-shaped ends to prevent it slipping from place.

An improved tie strap holder for harness has been patented by Mr. Elias A. Blickenstaff, of North Manchester, Ind. The invention consists in the combination, with a harness terret, of a rigid base bar, an elastic arm, and a spring.

IMPROVED FENCE.

The engraving shows an improved portable fence, recently patented by Mr. Daniel T. Hazen, of East Milan, Mich. This fence is made up of a series of similar panels interlocked so as to form a zigzag structure, having the general form of the ordinary rail fence, but consuming much less material than the ordinary rail fence, besides being stronger and more durable. The general appearance of the fence is shown in Fig. 1, with the angle and manner of locking the panels together.

Each panel consists of four rails, two triangular vertical posts and two vertical end pieces, one of which is attached to the top and bottom rails, the other being attached to the projecting ends of the two central rails. When the fence is put together the projecting ends of the middle rails of one panel are inserted in the vertical opening at the end of the adjacent panel, and the ends are interlocked, as shown in the engraving, and are held in place by wooden buttons attached to the triangular posts by means of screws.

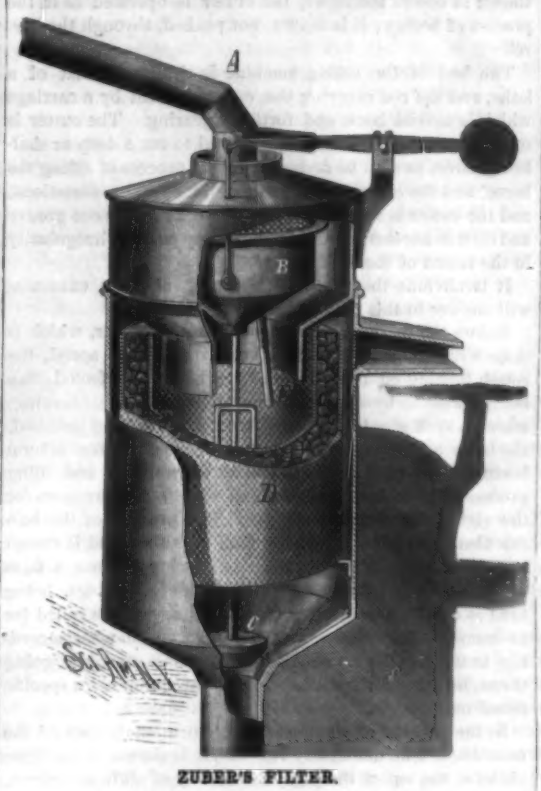
The panels are supported by short posts which are planted in the ground and receive the lower rail of the panel in notches near the upper end. A wooden button prevents the rail from becoming accidentally displaced. The advantages claimed for this fence are great strength and durability with a minimum of material.

HAZEN'S PORTABLE FENCE.

IMPROVED FILTER.

The engraving shows an improved filter which purifies the water passing through it and removes the sediment automatically.

The invention consists in a cylindrical vessel containing a tubular sieve, D, filled with charcoal, and provided with a spout at about half its height, and with a valve opening in the funnel shaped bottom, closed by a valve, C, attached to



ZUBER'S FILTER.

a rod carrying a cup-shaped vessel, B. This vessel is connected with one end of a balanced lever, so that when the water enters the filter through the pipe, A, the cup-shaped vessel is filled and descends, the valve closing the aperture in the bottom of the vessel, when the water rises in the cylinder, passes through the sieve and charcoal, is purified, and passes off through the spout. When the supply of water is cut off the water is removed from the cup-shaped vessel by the siphon, E, and the weight of the lever raises the vessel, B, and the valve, C, so that the sediments can be washed off through the bottom by the water running from the filter.

Local Lightning.

The San Francisco *Chronicle* says there is a tract of country in Butte County, Cal., about fifteen miles long by half a mile in width, where lightning strikes trees nearly every time a storm passes over. Outside of this strip there is no such damage. The line can be plainly traced by dead timber. As many as three fires have been caused by lightning in this tract in one single storm.

The Transplantation of Bone.

The greatest discovery in surgery, thus far in the year 1881, is that of Dr. William MacEwen. He has successfully transplanted bone—fragments of wedges of bone taken from patients for curved tibiæ—into the arm of a child whose limb was useless by reason of extensive necrosis; two-thirds of the humerus had been destroyed and no repair of bone had taken place. A good new humerus was the result, less than an inch shorter than its fellow.

Statistics of the New York City Steam Elevated Railways.

A recent inventory of the property of the elevated railroads of this city shows as follows: Number of engines, 209; number of cars, 612; miles of road, 32; stations, 161. On four lines 198 locomotives and 571 passenger cars are in daily use; 44 engines are employed on the Second avenue line, 71 on the Third, 62 on the Sixth, and 21 on the Ninth. On the Second avenue line 110 cars are required, on the Third 208, on the Sixth 190, and on the Ninth 68. Thirty-four hundred and eighty trains per day are run—560 on the Second avenue line, 1,750 on the Third, 816 on the Sixth, and 354 on the Ninth. Of the 3,374 men employed, 600 are charged to the Second avenue line, 1,267 to the Third, 1,005 to the Sixth, and 552 to the Ninth. Of the classifications the most important is the engineers, numbering 309, and receiving from $3 to $3.50 per day each. The receipts vary from $14,000 to $18,000 per day. As many as 274,023 passengers have been carried in a day. The engineers receive $26,250.89 a month; the 258 ticket agents are paid from $1.75 to $2.25 a day, or $14,111.60 per month; the 231 conductors receive from $1.90 to $2.50 a day, or $13,434.76 per month. There are 308 firemen paid from $1.90 to $2 per day, amounting to $15,179; also 395 guards or brakemen, paid from $1.50 to $1.65 per day, or $16,289.97 per month; 347 gatemen at $1.25 to $1.50, or $12,105.22 per month. The above items do not include the machinists and other employés in the mechanical department or the general officers or clerks. The total amounts per day paid to these classes of employés are: Blacksmiths, $2; boiler makers and carpenters, $2 to $3; painters, $1.75 to $2.60 in the shops and from $1.50 to $2.25 on the structure. The total payroll for the month foots up $165,566.66, or an average of $5,511.88 per day. The 161 stations, or stopping places on the lines, require 4 inspectors, 258 ticket agents, and 319 gatemen; 106 porters are employed to attend on these to clean and keep the cars and stations in order. There are 33 carpenters, 27 painters, 69 car inspectors, 140 car cleaners, 40 lamp trimmers, and 470 blacksmiths, boiler makers, and other mechanics employed on the structure and in the shops. Most of the ticket agents are telegraph operators, still 13 additional operators are employed.

The Panama Canal.

A correspondent of the *Journal des Debats*, writing from Panama, gives an account of the progress made thus far with M. De Lesseps's great undertaking. The first practical work of any importance yet completed is the construction of a grand pathway from Colon to Panama, which has been cleared of trees and other obstructions to a width varying from 30 to 60 feet. Now that this clearance has been effected, it is possible for the first time to get a clear idea of the work which is before the company. Hitherto it has been only by rather vague guesses that the lie of the surface could be conjectured, inasmuch as the thick foliage of the trees, spreading over the valleys and ravines, often made it difficult even to see that these existed. If it was assumed, as the *Debats* thinks, that in these cases the ground was as flat as the tops of the trees, then the discovery of deep depressions so arched over will be a great gain in estimating the extent of the excavation works. There is, however, another point in which the most recent explorations are regarded as unexpectedly favorable. It was assumed when the plans were made that all along the route of the projected canal a stratum of hard rock would be found underlying the soil at a depth of about 12 feet. But at Emperador, where the principal borings have been made, it is stated that on March 31 the instrument had reached a depth of 37 feet without finding any rock, and even at that point the rock which appeared was only a layer about 6 feet thick, succeeded underneath by a mixture of clay and soft stone, which went down to a depth of 64 feet, where the bore was still working lately without encountering any rock. It is now said that the excavation works will be begun about October next, after the rainy season, and in the meantime the preparatory operations are being actively carried on by companies of workmen, recruited from among the inhabitants and from Carthagena, whence they have been driven by an invasion of locusts.

AMERICAN INDUSTRIES.—No. 75.

THE FIREARMS MANUFACTURE.

In 1866, the house of E. Remington & Sons, through its President, Mr. Samuel Remington, first undertook to compete with European manufacturers on their own ground in the making of military firearms. Since that time more than a million of Remington rifles and carbines have been exported, besides large quantities of fixed ammunition.

Previous to that date we had imported arms in large quantities, while the exports were merely nominal, but the impetus given to this branch of industry, through the Messrs. Remington, was such that American manufacturers have since been able to compete successfully with those of all other countries. The effort of late years has been mainly in the direction of perfecting a simple breech-loading gun, and over five hundred patents were taken out for this purpose from 1860 to 1871, to what practical end may be judged when a leading authority on this subject states "that with the single exception of the needle-gun, every arm on a breech-loading system used in Europe is of American origin, both in principle and application, a large portion being of American manufacture."

But it is more in the making than in the pattern of the gun that American manufacturers have revolutionized old systems, and marked out the method by which firearms are now produced far better and cheaper than formerly. The making of each part to an exact gauge, with all pieces of the same part interchangeable, was at first deemed only an "American notion," so impracticable as to seem ridiculous in foreign eyes—involving the idea of making each arm a perfect pattern. But after this system of manufacturing had been proved a success here it was gradually introduced abroad, although in many cases the machinery and the gauges, as well as instructors, were sent out to establish the manufacture on such basis. The production of guns on this system involved elaborate and complicated sets of machinery, the improvement of which has been going forward through many years, while the patterns of the arms themselves have, at the same time, been undergoing continuous change, the less practical being eliminated, and those now principally made representing, naturally, the "survival of the fittest."

The illustrations on the first page of this paper represent the principal details of the firearms manufacture as conducted at the establishment of E. Remington & Sons, at Ilion, N. Y. The improvements made by the Remingtons in different arms, and their skill in the manufacture of arms of uniform excellence, have given them a world-wide reputation. Their system has been adopted by the governments of Spain, Holland, Egypt, Denmark, Sweden and Norway, by several of the South American Republics, and by China, and they have made large sales of rifles and carbines to France and to the United States army and navy. Their production at Ilion, on the order of the Provisional Government of France, in the fall of 1870 and spring of 1871, is believed to have been on a larger scale than ever before realized in any public or private arms factory, amounting in round numbers to more than 1,400 rifles and about 200 revolvers per day. This was with double gangs of workmen, each working ten hours, the factory being run twenty hours out of the twenty-four. Besides arms for military purposes, however, which are ordered in such large quantities in war times, their regular production includes a great variety of sporting and hunting rifles, shotguns and pistols, cartridges, bullets, shot shells, rifle canes, loading implements, etc. The simple commencement of this great industry was made by Mr. Eliphalet Remington in 1816, in the producing of a barrel for a rifle, at a disused farm forge, which was so successfully accomplished as to lead to the following of the arms manufacture as a life occupation.

The making of guns may naturally be divided into three general parts—the work on the barrel, that on the breech system, and the woodwork. The usual service arm, and a product of very high excellence for any kind of firearm, has a barrel made of decarbonized steel. It is first cut from a round bar of about two inches in diameter, and from eight to ten inches in length, according to the length of barrel desired. In this shape it is styled a barrel mould, and goes to a drilling machine, where a hole is made through its center, after which it passes to the barrel rolling machine, an illustration of which may be seen in the center of the first page, with the cutting of the moulds and drilling on either side. The barrel rolling machine consists of powerful grooved rolls, working together, the grooves being part cylinder and part taper, through which the heated barrel mould is successively passed, with a mandrel through the hole previously drilled, until the mould is drawn out to a rough pattern of the future gun barrel. After this the barrel is sawed off to the proper length, goes to the annealing ovens, is straightened on the outside by being passed between dies representing each one-half of the barrel, and is then ready for the first or "nut" boring, shown in one of the views. In this operation the revolving cutting tool is drawn, not pushed, through the barrel, the tensile pull on the steel bar which draws the tool tending to keep the latter more exactly in the center, from its spring to unequal resistance, more effectually than would be the case with a rigid borer. After this first boring, another boring is made with a somewhat larger tool, and then the barrel is examined to determine its straightness and the exact work of the bore. This is shown in a little picture to the right, about the center of the page. The interior of the barrel being bright, on looking through it at a bar across a pane of ground glass, the dark line thereof will make a certain definite and exact projection along the interior, a break in which, or a wave, indicates imperfection or that the barrel is not true. The lines of light have certain definite proportions to the shadows, so that, looking in at each end of the barrel successively, its whole interior may thus be carefully examined, and the defects ordinarily found are so slight that a blow or two with a hammer will rectify them. In the rifling, the department for which is shown in one of the views, the cutter is operated as in the process of boring; it is drawn, not pushed, through the barrel.

The bed of the rifling machine is similar to that of a lathe, and the rod carrying the cutter is held by a carriage which is moved back and forth by gearing. The cutter is so constructed that it may be adjusted to cut a deep or shallow groove, as may be desired. In the process of rifling the barrel and the cutter-bar are turned in opposite directions, and the cutter is so operated that it works first in one groove and then in another, so as to equalize any possible irregularity in the action of the tool.

It is obvious that nothing short of absolute exactness will answer in this part of the work.

Before the boring is finally completed, however, which is done with a square reamer, revolved at higher speed, the rough turning on the outside of the barrel is effected, this being followed by another boring, and then another turning, after which the outside of the barrel is ground and polished, the latter operation not being completed until the several borings have been finished and all the milling and filing processes have been gone through with to prepare seats for the sights, square off ends, etc. The proving of the barrels also takes place before the final polishing, and is shown in one of the views, forty barrels, resting against a false breech, and heavily loaded with powder and slugs, being fired at once. The number of distinct operations called for to complete the work on the barrel vary somewhat according to the arm being made, in some cases the piece going through eighty different hands, each of whom has a specific detail to attend to.

In the making of the breech system, a small part of the most important machinery for which is shown in the three views at the top of the page, the variety of different pieces, for the many kinds of arms made, is almost innumerable. As nearly everything is done by machinery, each different piece requiring its special contrivances and tools, their mere enumeration would make a list whose perusal would be tedious. In milling machines alone there are some four hundred, and in lathes, drills, and every description of metal-working and labor-saving device, the machine plant is so large as to avoid the necessity of changing about in tools and fixtures for the production of the different pieces, a matter which in itself proves not only economical in the time of the workmen, but is an effectual aid in securing the exact duplication of parts.

The Remington breech system, which was first brought forward in 1865, and has since been improved in many details, is distinguished for the simplicity of its action, the largeness and strength of its parts, without any excess of metal beyond what is required for the wear and strain to which they are likely to be subjected, its non-liability to be readily injured by exposure to moisture, and the ease and expedition with which it can be manipulated. It has less parts than are found in most other breech loaders, but this has been attained without sacrificing any mechanical advantages, while giving less frictional surface, and the force of the recoil shock is so admirably distributed that an excessive charge or a defective cartridge cannot cause injury. Briefly described, the receiver, which is of wrought iron, case hardened, includes the frame made to correspond externally with the stock, and is screwed to the breech of the barrel, and in this receiver are the breech block and lock action. The breech block and hammer are of steel. To load, the hammer is brought to full cock; the breech block is pulled back by the handle at its right side, ejecting the shell of cartridge formerly exploded; the cartridge is inserted, and the breech block is pushed back to its place, closing the breech. The rapidity with which the gun can be loaded and fired has been frequently exemplified, squads of soldiers loading and firing from the shoulder, "taking fair aim," at the rate of 25 shots in from 2 minutes 8 seconds to 2 minutes 55 seconds.

In the making of the stocks, one department for which is illustrated at the bottom of the page, the eccentric lathe, first brought out by Thomas Blanchard, effects a large part of the work, but much other machinery is now used in the different operations. The wood is first kiln-dried, then sawed out in the rough, and left in this shape till thoroughly seasoned. Then it is faced off on the part where the barrel is to fit, and in two subsequent operations is turned to the requisite shape, this being afforded by a pattern stock or former, of cast iron, in accordance with the shape of which the cutters, running at a very high speed, are made to work on the wood. It is an old story, but one of the most effective ever related concerning an American invention—how this Blanchard lathe, at first received with incredulity, finally effected a revolution, not only in the making of gun stocks, but most other kinds of turning. Besides this machine, however, there are others for lock and guard bedding, and for working checks or designs on the stocks, all working to special patterns, and not only producing more exact shapes than could be made by hand, but doing the whole work on a gun stock in less time and with fewer hands than were formerly required for the sand-papering alone.

In the "assembling" room, a view of which is shown at the bottom of the page, and to which all the separate parts are brought as they are finished, the arm is finally put together. In a rifle there are fifty-five parts, the number of parts varying with each different kind of arm, but they all only find their proper place in the piece after they reach the assembling room from the various workshops and departments.

In guns for sportsmen or for match shooting, as in pistols, revolvers, etc., the same system is carried out, the workman who has the making of one part of an arm having also gauges to determine its exact size and shape, and the firm keeping duplicate sets of these gauges. The plan on which work is carried on here is one which constantly stimulates competition, for the making of each part of the gun is done by contract. The firm, of course, own all the plant and material, but, subject to the established rules and regulations, the most skilled mechanics or the best executive hands in the various shops put in bids for the complete work in making the special parts for which they have been found most competent, and the work is let out in this way. By such means the workmen have been brought to take a more direct and active interest in the prosperity of the firm than is usually the case in large manufacturing establishments, each contractor hiring his own gangs, and all working together in a sort of friendly rivalry, which is more suggestive of a kind of family regard than the ordinary relations of employer and employe.

The great improvements made in recent years in the preparation of fixed ammunition are fully exemplified in the departments where this branch of the business is carried on at Ilion, of which two views are given. Nearly all the bullets now used are elongated, and are made by compression or swaging, by which they can be produced more uniform in size and weight, more homogeneous, and more accurate. For this purpose a bullet forming and a bullet trimming machine are used, in which the exact shape is given to the bullet by steel dies and punches. A lubricating machine is afterward used to force into the grooves of the bullet a composition, for which bayberry tallow, 8 parts, and graphite, 1 part, is considered the best.

The making of the cartridge shell is effected by a double-acting press. What are known as "center fire" cartridges are now greatly preferred to the former style with "rim fire," in which the fulminate was deposited in a thin ring around the rim at the base of the cartridge. Center fire cartridges have a cup anvil in the center of the base for exploding the fulminate, of which much less is needed, while the cartridge thus made is safer against accident, and its shell may be made stronger and better proportioned. The latter cartridges are more expensive, but the shells may readily be reloaded with simple contrivances for this purpose, and many times reused. In the loading of the shells at the factory several machines are used, one to prime the cup, one to insert it in the cartridge, and another to load with the powder.

This is accurately done by weight, as a difference of one grain in a charge would make a material variation in the trajectory of the bullet, and to this extent destroy the accuracy of the sights. All the operations connected with the loading of the cartridge have been so perfected in recent years that accidents are now almost impossible, and the discharge of powder or fulminate in the machines would be practically harmless so far as the operative is concerned.

Among the recent improvements introduced by the Remingtons perhaps the most important is their magazine gun, in which the magazine is located under the barrel, and carries nine cartridges, besides one in the chamber. The cartridges are held securely while passing from the magazine to the chamber of the barrel, but they do not pass over the carrier until the gun is opened for the purpose of loading, so that the firing of a defective cartridge in the gun cannot explode one of those in the magazine. The United States Government has ordered a number of these guns for use in the navy, although it had not been brought to its present state of perfection until after the competitive trials preceding the order had been made.

Besides the regular manufacture of standard arms, as above described, the Messrs. Remington have also won a high reputation for their productions in the line of fine sporting guns, target rifles, etc., with barrels of Damascus twist, Stubs twist, and laminated steel. The great number of inferior twist barrels which now find their way into the stores, renders it a matter of no small importance in purchasing a gun to be sure that the material of which it is made is as represented, and not the easily produced imitations which can be made of iron of inferior quality, but which are in reality worth much less than the homogeneous steel rolled barrel. In these goods extraordinary care is given to the manufacture of the barrel in its interior finish, delicate gauging, and careful straightening process—the latter being an operation never yet perfectly attained by any mechanical process, and in which but few men are ever capable of becoming experts.

The armory at Ilion, as shown in one of the views, consists of a group of buildings covering about four acres. Almost the entire business of the town is furnished by the industry here carried on.

Mr. Remington, its founder, died in 1861, and the incorporation now known as E. Remington & Sons dates from 1865, Mr. Samuel Remington being President, Philo Remington Vice-President, and Carver Remington Secretary.

The New York office and salesrooms of the firm are at 281 and 283 Broadway.

AMERICAN SARDINES.

BY H. C. HOVEY.

The true sardine is a fish found near Sardinia, in the Mediterranean Sea. But the same fish swims in other waters; and although its qualities may be slightly changed by its surroundings, naturalists recognize no difference. As a matter of fact, most of the sardines in market were caught along the coast of Portugal and Brittany, the principal place of export being Bordeaux. Crossing the Channel to Devonshire and Cornwall, we find the very same fish under the name of pilchard; and it is stated by an English authority that, on an average, 30,000 hogsheads are annually exported, and chiefly to points along the Mediterranean. And as 2,500 of these little fish are reckoned to a hogshead, it makes the average annual catch of pilchards 75,000,000.

The wide spread family of the *Clupeidæ*, to which the sardine belongs, includes many allied species, most of which are valued as food fishes, while some of them are highly prized by epicures. What are known as "Spanish sardines" are the *Harengula*, of the West Indies, and the *Pellona* of South America. Whatever may have been originally meant by "Russian sardines," the name is now applied to spiced herrings; and the majority used in this country are caught in our own waters, sent in bulk to New York, Chicago, Minneapolis, or points still farther West, where dealers who wish to create the impression that they are imported put them up in small kegs with willow hoops and foreign labels.

The term "American sardines" was first applied to a preparation of the smaller menhaden or whitefish, a fish mainly valued for its rich yield of oil and its merits as a fertilizer. By steaming its bones were softened, and when packed in olive oil it was offered as a substitute for the sardine. Those that were too large to pass under that name were called "shadines." Glowing accounts of the new business appeared in the New York papers; the goods received a medal of merit in 1873 in Vienna, and a silver one the next year at Bremen, and it is claimed that in a single year 30,000 dozen cans were packed and sold. But for some reason the popularity of menhaden sardines suddenly waned, and the business has now practically gone out of existence.*

My especial object in this paper is to call attention to a totally different enterprise, developed within the last eight years, and that promises to become one of the most important industries of America.

I refer to the sardine factories of Eastport and other ports along the coast of Maine. The facts have never been published, so far as I am aware, except in an imperfect form and in local papers. My attention being thus called to the subject, I visited the factories, and from the men managing them obtained the facts now laid before the public.

The rule of "no admittance" was strictly enforced at every factory; but, owing to the kindness of Mr. R. C. Greene, of Eastport, who was well known to all parties from whom information was sought, and also to the fact that I represented the SCIENTIFIC AMERICAN, an exception was made in my favor, and I had the fullest opportunity of seeing every step of the process.

Before giving the details, however, the reader may be interested to know how the business originated. In its present form it was begun as the result of independent experiments made by Mr. Julius Wolff, of New York city, about eight years ago, at his factory on Jay street. He was convinced that sardines could be packed as well in the United States as in Europe. And with that idea in view, he experimented, not very successfully, on the pickled herring brought to the New York market, first extracting the salt, and then putting them up in olive oil. Two years later he engaged Mr. Henry Sellman, who had already had experience in packing herring, and they formed the "Eagle Preserved Fish Company," for the purpose of packing the so-called Russian sardines and anchovies in vinegar and spices in wooden kegs. The next spring the company began its operations at Eastport, Me., because both fish and labor could be had cheaper there than elsewhere. Mr. Wolff did not go in person at first; but when he did so, a few months later, he was at once struck with the adaptedness of the fine fresh herring of the smaller sizes for the manufacture of oil sardines, and telegraphed to his New York partner, Mr. Reesing, to know if he had better disclose the important secret to Mr. Sellman. The result of this conference was that the secret was imparted not only to Mr. Sellman, but also to Mr. William Martin, whom the company had employed as a buyer and packer, both of whom feared that any investment in that direction would be a loss, as money had been sunk in similar experiments before by a Portland firm. They agreed to make a trial, provided Mr. Wolff would furnish the oils, sardine cans, etc. This he did, thus furnishing both the original idea and the capital to prove its feasibility.

Among the early experimenters in putting up domestic sardines should also be mentioned the firm of Hansen & Diekmann, of New York, who sent to Eastport for that purpose the empty boxes and cans, the oil, and other ingredients necessary. That was in 1875. Their present superintendent is Mr. Baumeister. The former occupant of that office, Mr. P. M. Kane, is now in charge of an auxiliary factory. Other auxiliaries have been started since, and the amount of business done by them all is very great. I have seen it stated that Mr. Kane sometimes packs 5,000 cans for market in a single day; and I presume that others do as well.

About 2,000 cases of oil sardines were put up by the Eagle Company during the first year at Eastport; but they were disposed of at a loss because of the large expense involved, and the suspicions awakened by newspaper attacks. Only the smallest sized herrings could be used for the above purpose, and in order to make use of the larger sizes Mr. Wolff invented the so-called "sardine marinée" and the "mustard sardines," packed in larger boxes, in spices and mustard. The demand rapidly increased, and also the opposition to the enterprise. Two years ago, Mr. Sellman and Mr. Martin left the original firm, and formed the "American Sardine Company." Mr. Wolff then removed from New York to Eastport, and gave his personal attention to his packing houses there, with such increased facilities that last year he manufactured nearly 38,000 cases of sardines, there being 100 boxes to a case. This includes the sardines in oil and in spices, and about 1,500 cases of fried and broiled mackerels. The entire packing by all firms, for 1880, is estimated at about 70,000 cases, while the total number reported as imported from Bordeaux, Port Louis, Nantes, Lorient, etc., did not for that year exceed 100,000 cases.

The number of factories has been nearly doubled since last year, there being now fifteen at Eastport, three at Lubec, three at Jonesport, and four at other places in Maine, the largest of all being at Millbridge, where may be found the most improved modern machinery. As may be imagined, there is some degree of rivalry, and possibly of jealousy, among these various concerns, but I believe all agree in according the honor of originating the business to Mr. Wolff, while claiming for others the merit of some improvements.

As I am writing for the information of the reader, and not in the interest of either importers or manufacturers, it is necessary for me to say that, after considerable inquiry among retail dealers in New York and other cities, I found that many of them regard the American sardines with suspicion, and even positive disfavor. This may be attributed to two causes, namely, the fact of their being sold under the guise of French brands, to the best of which it is claimed that they are equal, though the difference can be detected by an expert at once; and the fact that the manufacturers, deserving great praise for what they have done, have something yet to learn as to the art of curing and packing.

Any one, however, who should go, as the writer has done, through the factories at Eastport, and witness the thorough neatness and cleanliness of all the processes, cannot help feeling both that the business ought to prosper, and that it ought to stand on its own merits without calling in the questionable aid of foreign labels. After considerable examination, I am prepared to say that, while the Eastport sardines are inferior to the best imported goods, they excel the less choice brands, and there is unquestionably a place for them in the American market. The impression prevails, and has some foundation in fact, that, instead of using, as is claimed, "pure olive oil," the article used is largely adulterated with cotton seed oil and other cheap oils, a trick that has also, it is said, been learned in canning French sardines.

I cannot be expected to explain the difference that certainly exists between the various brands of American sardines; but it is not entirely due to the mere quality of the fish and oil used. It is in a measure due to the diversified methods of curing and packing, the best of which are guarded as secrets of the trade.

The process in general is as follows: The small herring are caught in weirs built among the small islands and in estuaries; and it is of the first importance to get the fish to the factories in the quickest time possible. For this reason, and also because of the large number of boats employed, steam tugs are used for towing the dories in. On arriving at the works, the boats are unloaded, the fish are thoroughly washed in pure spring water, and carefully sorted. All that are bruised or injured in any way are thrown out, the larger herring are packed in barrels for other purposes, while the smallest only are placed on long tables, where their heads and tails are cut off and they are properly cleaned. All the refuse is ground up as pomace and used for fertilizing; hence nothing goes to waste.

From the cutting sheds the herring are passed into the flake room, where they are salted and laid singly on wooden flakes, and after dripping they are passed into the drying room, where they are dried on racks, along which the flakes are arranged, machinery being used admitting hot and cold air. These flakes covered with the dry fish next go to the frying room, where they are placed in large shallow pans of boiling oil. Again they are assorted, and only such as are properly cooked are kept and carefully laid in cans, nine fish in each can. Hot oil is then poured in, the cans are sealed, a small orifice is made to let out superfluous steam, and then, thus prepared, they go into the bath room, where a large tank filled with boiling water receives them. On being removed, the orifice is soldered, and each can is critically examined for leaks, the rejected cans being returned for proper treatment, while the perfect ones are sent to the cleaning room, where upon large box-like tables covered with sawdust, or, in some factories, in revolving cylinders filled with sawdust, the cans are cleansed and polished. Having undergone a final inspection, they are sent to the packing room, where they are packed, 100 boxes in each case, and thence shipped to market.

Some of the factories are supplied with McKinney's patent oven, costing from $2,500 to $3,000. In using this the fish are first cooked by steam, and then baked in the oven to remove all moisture. This obviates the necessity of wiping each fish separately by hand. The superiority of the baking process over the old French method of frying is clear when one considers what takes place in the huge iron frying pan. A constant ebullition goes on, by which the particles of waste matter thrown off from the frying fish, and, sinking to the bottom, are thrown up again to the surface, to sink and rise again, having been exposed to a highly heated metallic plate, and this carbonization of waste material gives a disagreeable taste to the sardines, which become impregnated with all the ingredients in the frying pan.

I have aimed to do justice to the manufacturers of American sardines; and they really have done great things, especially considering the obstacles they have had to contend with. But if they would do their best, conscientiously using pure materials, as well as availing themselves of all the latest improvements, they could not only meet with large sales, which they now do, but the market for French sardines would soon become quite limited in this country. But if that desirable day were not still in the future, the can factories of Eastport would not employ their expert tinsmiths in cutting cans from sheets ready stamped with foreign labels; but would have pride in bronzing the company's name on every can, in good, honest English.

And while to the skeptical consumer it may seem incredible that a fish hitherto seen chiefly in the coarse form of smoked herring and bloaters could by any process be made to rival the delicious sardine from the land of olives, he should remember that the renowned "whitebait," a dish for British lords, is but the young of the English herring, which is said by the United States Fish Commission to be identical with the herring caught along the coast of northern New England.

If American sardines are not now equal in all respects to those that are imported, it is due to causes that can and should be removed; and those who have exhibited such enterprise and skill in their manufacture deserve to be encouraged to carry on to perfection the work they have begun.

*See Professor G. B. Goode's exhaustive report on "The Natural and Economical History of the American Menhaden," 1877.

A Steam Launch with a Novel Engine.

A steam launch, called the General W. B. Franklin, was recently tested at Ramapo, N. J. It was built to illustrate the working of the Colt disk engine, the invention of R. D. West, and the results obtained are reported as very promising. The special advantages claimed for the new engine are simplicity, small bulk, and easy handling. The machinery is described as follows: The main body of the engine contains six cylinders, arranged in a circle and parallel with one another, like the chambers of a revolver. The pistons take the form of a hollow plunger, one end terminating in a blunt cone, which beats continuously against the periphery of the disk. They are single-acting, being subject to steam pressure upon the flat end only. Steam is admitted successively to the six cylinders from the steam chest, three pistons being constantly in action at different points of the stroke, thereby imparting a uniform rolling motion to the conical disk, which is steadied at its center by a ball and socket joint, and rolls upon the surface of the back plate which receives the full thrust of the pistons and protects the ball and socket from strain. There is a flat circular ring, a valve which receives motion from an eccentric carried by a shaft which passes through the center of the steam chest, which ring slides steam tight but perfectly free between the port face and a balance plate that prevents the steam pressure from acting on the valve and makes its movements nearly frictionless. The steam is admitted to and fills an annular space left in the steam chest outside the circumference of the valve ring, the eccentric motion of which alternately opens and closes all the steam ports, successively admitting steam to the cylinders, from which it again escapes to an exhaust chamber formed by the inside of the valve ring, and thence through openings into the body of the engine, and is finally discharged by an exhaust pipe. The engine is constructed to cut off steam at half stroke, but the cut-off can be altered to any point, from one tenth to full stroke. There are none of the keys, colters, and set screws incidental to ordinary engines, and as the strains are always in one direction, either knocking or pounding is impossible, while the various parts are all free and unconnected with one another, and in nearly all cases where they touch the contact is a rolling one.

The Postal Business of the World.

A German paper has been compiling the statistics of the world's correspondence by post and by telegraph. The latest returns which approached completeness were for the year 1877, in which more than 4,000,000,000 letters were sent, which gives an average of 11,000,000 a day, or 127 a second. Europe contributed 3,036,000,000 letters to this great mass of correspondence; America, about 760,000,000; Asia, 150,000,000; Africa, 25,000,000; and Australia, 50,000,000. Assuming that the population of the globe was between 1,300,000,000 and 1,400,000,000, this would give an average of 3 letters per head for the entire human race. There were in the same year 88,000 telegraph stations, and the number of messages may be set down for the year at between 110,000,000 and 111,000,000, being an average of more than 305,000 messages per day, 12,671 per hour, and nearly 212 per minute.

A COMPACT BATTERY.

The desiderata in a galvanic battery may be briefly stated as compactness and ability to produce a strong and constant current of electricity, cheaply, and without eliminating poisonous or corrosive fumes.

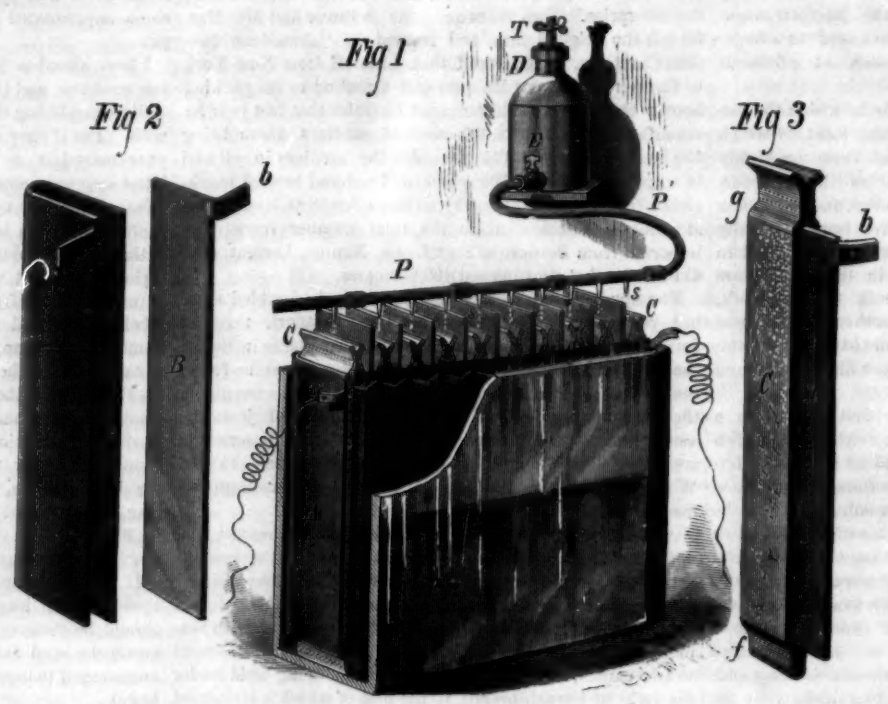
The form of battery described below was designed to cheaply overcome some of the annoyances commonly attendant upon the use of large or *intense* batteries as well as to economize space and labor of maintenance.

In Fig. 2, A is a sheet of copper, about eighteen inches long and ten and a half inches in width, bent U-shape lengthwise, and provided with a short copper strap or ear, at *a*. B, Fig. 2, is a strip of zinc, about fifteen inches long and four and three-quarter inches wide. The flannel envelope, C, is made of one piece, nine inches wide and twenty-one inches long, doubled upon itself and stitched together at *g* and *f*, so as to snugly envelop the zinc plate. In setting up the battery, the copper is coated thickly with a paste of calcined lampblack and dilute sulphuric acid; the plate of zinc is fitted into the cloth envelope, previously moistened with dilute sulphuric acid, and this in turn is put into the copper, so that the cloth projects an inch or more above and below the latter. It is necessary that the copper should firmly press upon the cloth envelope, but it must not touch the uncovered zinc plate. The couples thus arranged are packed tightly together in a wooden frame or case, with a sheet of paper saturated with paraffine between each, as shown in Fig. 1. The plates are then joined in series—the zinc of one with the copper of the next, and so on—the ears, *a* and *b*, Fig. 2, serving for connections. The tube, P P', Fig. 1, is made of glass, or of pieces of glass tubing joined by vulcanized rubber tubing, and is connected with a reservoir, D. At points, *s*, *s*, *s*, along this tube, and just over the expanded ears of the projecting cloth envelopes, are arranged glass dropping tubes, so that when a liquid flows from the reservoir, D, through P P', an equal quantity of it escapes through each of these upon the cloth below. The flow of liquid from the reservoir can be controlled by the stopcocks at E and T.

Fig 1

Fig 2

Fig 3



FOUNTAIN BATTERY.

The battery is operated as follows: The reservoir, D, having been filled with a solution of three-quarters of a pound of potassium bichromate and about one pound of sulphuric acid in a gallon of water, the stopcock, E, is opened, and the solution allowed to trickle slowly upon and down through the cloth envelopes, escaping at the bottom into a leaden or enameled tray. The battery thus arranged develops a considerable electromotive force, and, when the reservoir is properly adjusted, is remarkably constant. Should it become clogged up with chrome alum (and this does not often happen), or when it is not required for use, it can be cleaned without disconnecting it by allowing warm water, instead of the solution, to flow through the pipe, P P'. The zinc plates can be easily taken out without removing the envelopes. A battery of this kind of one hundred cells can be put up in a box three feet long, one foot wide, and two feet deep. It can be fed from a single reservoir, and will produce a very fair arc light.

DEVICE FOR CATCHING POTATO BUGS.

We give an engraving of a novel device for catching potato bugs, recently patented by Mr. W. B. Parker, of Green Island, Neb.

The apparatus consists of a semicircular basin of tin, with one side extended to form a shield. The handle by which the basin is carried is attached to this shield. The manner of carrying the basin is so clearly shown in the engraving as to require no explanation.

The bugs are knocked from the vines into the basin by a paddle having an oblique handle, and the bugs are prevented from escaping from the basin by an inwardly projecting rim at the top.

PARKER'S POTATO BUG CATCHER.

A Fishing Wheel.

A new and very destructive fishing device is reported from the Columbia River, Oregon. It consists of a jetty of rocks built out from a point on the shore of the river, outside of which is a planked sluiceway, in which an undershot wheel with large tank buckets revolves. The sluiceway was built when the river was at its lowest stage of water, and the wheel is hung so that it can be raised or lowered, as may be desired, according to stage of water. The instinct of the salmon is to run up the river alongside of the banks instead of mid-channel. By this the fish can take advantage of the eddies below jutting points of land. On these projecting points the Indians have from time immemorial taken salmon in large numbers by using dip nets. The jetty built out from the point above named makes a larger and longer slack water behind it, and the salmon rounding the point rush into the sluiceway to get up the river. In the sluiceway, the wheel, which revolves in the current, is gauged so as to sweep within a foot of the bottom, and the salmon are scooped up in the tanks or buckets, which latter let out the water as they ascend. On the wheel descending the fish are thrown out into a trough or gutter leading to a pen below, where they remain until taken away to be canned. The arrangement of the sluice, wheel, etc., is a most successful one, the catch of adult salmon, which are the only ones canned, running from 1,500 to 4,000 per day. There is virtually no expense in taking the fish save attending to the pen.

As the fishermen who take salmon in boats in the Lower Columbia River demand and receive from 50 to 60 cents per fish from the canneries, one can readily see what a vast profit the use of the wheel makes to the cannery connected with it. A fatal objection to this device arises from the fact that it scoops up and kills little fish as well as big ones, and as yet no provision is made, in connection with it, for the escape of the former. Unless the threatened wholesale killing of salmon too small for canning is prevented, the supply will be entirely cut off, and the entire canning industry destroyed, if the wheel comes into general use.

RECENT INVENTIONS.

Mr. John Hyslop, Jr., of Abington, Mass., has patented an improved method of trimming heads of nails and rivets. In the manufacture of tacks, nails, and rivets, they come from the machine with a fin around their heads, making the heads irregular in shape and size. Heretofore this fin has been removed either by placing them in a revolving drum or by forcing them through a die head foremost. The object of this invention is to permit tacks, nails, and rivets, with heads of any size or configuration, to be trimmed to give their heads the same size and shape, and to permit of their being fed automatically to the die from the nail machine.

An improved injector for steam boilers has been patented by Mr. John M. Holt, of Greensborough, N. C. The object of this invention is to provide a convenient means of indicating instantly to the eye or ear the condition of the injector when in operation, and at the same time to utilize the water that escapes at the waste pipe of the injector for washing out the ash pan of the furnace.

Mr. Calvin Dilks, of Allowaystown, N. J., has patented an improvement in horizontal water wheels of that form in which the water is admitted to the periphery of the wheel through lateral guides or chutes, and after striking the wheel is discharged therefrom centrally, downwardly, and upwardly, The improvement consists in the peculiar construction and arrangement of the buckets in the wheel, and in the arrangement of the wheel in the case for permitting its easy removal.

An improved ditching machine has been patented by Mr. Samuel C. Robinson, of Pemberton, O. This invention relates to that class of ditching machines intended to excavate a ditch for the reception of tile in its bottom; it consists of a wheel capable of being raised and lowered, and provided on its circumference with a series of curved spades for excavating the earth to form a ditch as the wheel revolves, which earth is carried up a circular chute concentric with the wheel by the curved spades, and discharged on the ground outside of the ditch by a quick semi-rotary motion of the axis of each spade.

An improved magnetic wheat cleaner has been patented by Messrs. Thomas J. Delany and John B. Morgan, of Kansas City, Mo. It consists of a grain spout having side openings and pivoted cylinders projecting into said spout, and having magnetic as well as non-magnetic surfaces.

Mr. Shubael Cottle, of New York city, has patented an improved form of bracelet of that general construction in which several tubular parts with swiveling joints are combined with a torsional spring arranged within it, whose tension serves to hold the sections of the bracelet in an elliptical form, but allows them to be opened by a lateral movement for the insertion of the wrist.

Messrs. Joseph A. Head, James R. Burville, and Cary A. Head, of Bainbridge, O., have patented an improved cloth-measuring machine, which consists first in the peculiar construction of the chuck for holding the reel shaft or cloth beam on which the cloth is wound or unwound, and the devices for adjusting said chuck, whereby it is adapted to hold cloth beams of different lengths, and capable of being adjusted to receive and hold a cylindrical reel shaft, or cloth beam or board.

An improved jacket for cans has been patented by Mr. Charles R. Peaslee, of Louisville, Ky. The object of this invention is to provide a sectional jacket for a can, which is so secured thereto that the can is free to move within the same, whereby it may yield in case of sudden twist to prevent breakage.

An improved earth scraper has been patented by Mr. John Hale, of Sidney, O. This scraper is formed of a scoop bent from a single plate of iron or steel, and provided with handles, clasps, and bent rod.

Mr. George H. Hutton, of Baltimore, Md., has patented an improved jump seat for carriages, in which the seat is supported by legs hinged to the seat and body, and provided with a removable and reversible stop, having bifurcations on its upper and lower faces.

Mr. Chester King, of Leadville, Col., has patented an improved potato digger, combining many points of novelty which cannot be clearly described without engravings. It will remove the potatoes from the earth and separate them from the vines and dirt.

An improved bellows has been patented by Mr. John H. F. Hankwitz, of Fond du Lac, Wis. The folding sides are made of triangular plates or boards hinged to each other and to the top, bottom, or intermediate board of the bellows, the joints being covered with a strip of leather, rubber, or other similar material.

A combined pocket door lock and burglar alarm has been patented by John A. Lee, Sr., of Chattanooga, Tenn. The invention consists of a sliding bolt for locking the door, window, or transom, and of a hammer for causing an alarm, the bolt and hammer being operated by mechanism attached to and contained in a small case, adapted to be attached to the door, window, or transom by a hinged claw plate.

A GREAT CORAL WORM, AND HOW CORAL REEFS ARE BUILT.

BY C. F HOLDER.

The process of reef building is an interesting one. We will suppose that the sea bottom is first visited by a single egg from the astrea, a small delicate speck of jelly. In a few days this has begun to show a few tentacles, and is apparently, if we should examine it, nothing more than a sea anemone; but, in a few weeks, while the *polyp* has been establishing itself, it has also been secreting alittle lime at the bottom of its tube, and fastened itself thereby to the object that it may have fallen upon, perhaps a clam shell. Now there will soon be seen a growth of lime upon the edges and sides of the *polyp;* it loses its likeness to a sea anemone, and is covered by a white jagged coating of lime. Soon another one is growing out alongside of the first, and the animal is capable of sending forth eggs as well. The single astrea has now become two by the process of growth much like that of the branching of vegetables, and this goes on indefinitely, while some species seem, after a time, to attain a definite form, and are thus a valuable element in this great work of building a continent. Besides the actual bulk which the stony astreas add to the work, there are many other forms which are brought in accidentally, and somewhat dependent on the first. When the bottom has become covered by the coral rock, there are numerous causes to produce a decay of the *polyps*. When these are dead the pores of the coral are filled up by sand, which adds a little to the height; other corals grow upon this, and the natural *débris*, which is always swaying about by the tide, is deposited here as well as elsewhere; then there are branching corals, which take root here, and gorgonias, or sea fans, and feathers. To make the reef solid and compact, nature grinds up the corals, disintegrates them, and the soft parts sift down, solidifying the entire mass. One of the great helpers in this work is shown in the accompanying engraving of a monster worm. It is a coral parasite, and a terrible one. The writer has watched it slowly crawling up the branches of the madrepores, until the end of one was reached. Its mouth, which is a sort of bag, envelops the end of the branch, the worm slipping over it like a glove on a finger, covering hundreds of the delicate *polyps* and sucking them out of their cells. When it has exhausted the supply it withdraws, leaving the branch as white as snow, in strong contrast to the rich brown of the others. This is done continually, and the bleached branch is soon broken off and falls to the bottom to help in the general growth of the area.

Myriads of other worms wind in and out among the astreas. Of them Coryell says:

"The nereis is nothing but a series of rings from head to tail, but it is most gorgeous in color, fairly blazing with iridescent tints. It lives in holes in rocks, or in the hollows of sponges or shells.

"To get about with, this worm has many little paddles, two on each ring of its body in fact, which move so fast that we can scarcely see them, and of course carry their owner very rapidly through the water. A nereis of four feet long has seventeen hundred paddles to carry it along. Besides this, there is another use for these paddles—they carry the worm's weapons. At the end of the oars are often seen what look like hairs, which are capable of being pushed out and drawn in. Looked at by the help of the microscope, these simple-looking hairs turn out to be a wonderful array of weapons—darts, curved double-edged swords, sabers, harpoons, broadswords, fishhooks, lances with barbs, and almost every sort of cutting blade. All these instruments of war, when not needed, are drawn back into sheaths in the little paddles, and so kept safe and ready for instant use. But this is not all: in each ring of its body are also tufts of branching filaments of bright red color, which are really gills, by which means it breathes. The nereis lives upon animal food, yet its mouth is a simple opening without teeth. Beyond, or back of it, is a sort of a bag, of large size for the worm, lined with sharp horny plates, or teeth. When the creature sees its prey it sticks this bag out of its mouth, inside out. The teeth are then thrust into the victim, and the bag drawn in, still holding on to what it has seized. The prey thus swallowed is eaten at leisure."

Late shells bore into astreas, so that solid appearing heads are often found to be mere shells. The holothurians prey upon the corals, and we have often found several ounces of ground coral in the long intestine of the *Holothuria floridiana*.

Another enemy of the branch coral is the great parrot fish. Its jaws are composed of solid pieces of bony dentine, and it easily breaks off the tips of the coral, grinding them up and rejecting the limy portions. The entire genus (*Scarus*) are essentially coral destroyers as well as reef builders.

A CORAL PARASITE.

(Showing the *Padena pavonia* in the foreground.)

THE COMMON PRAWN AND ITS PARASITE.

BY CARL F. GISSLER, PH.D.

The prawn is common in shallow water along the Eastern coast of the United States from New Hampshire to Florida. It is especially common on sandy bottoms among the eel grass (*Zostera marina*), where it occurs in countless numbers. Its transparent body, marked with irregular, ill-defined dark blotches and spots, admirably adapts it for concealment among the eel grass at or near the bottom. It occurs in company with the common shrimp (*Crangon vulgaris*) and other small crustaceans. All these shrimps and prawns are eagerly devoured by fish, and are therefore used as bait. It is, however, not alone a sweet morsel for the finny tribe, but both the prawn and shrimp are relished by man.

Fig. 1.

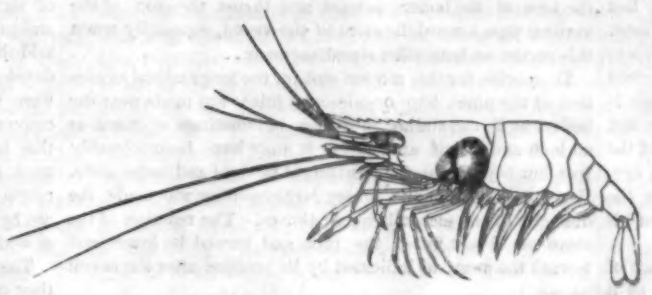
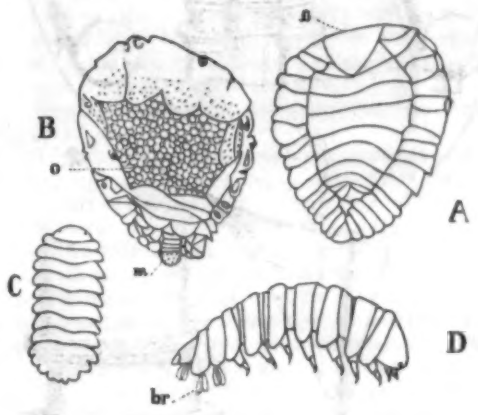


Fig. 2.



Another prawn (*Palæmonetes exilipes*) has a wide distribution in the rivers and lakes of the Western and Southern States. It is more slender and much smaller.

The body of a prawn has great resemblance to that of the larger craw or cray fish (*Astacus*) of the Western and Eastern brooks and rivers, and to the common lobster (*Homarus.*)

Two main body regions can be distinguished in the prawn, the carapace or cephalo thorax being the front, and the abdomen the hind part.

All decapod crustaceans have twenty segments in the body. The carapace covers the thorax or breast and conceals the gills; the latter are partly attached to the base of the mouth parts, partly to the legs. They have a pair of stalked eyes, two unequal pairs of antennæ, the hinder pairs being the longer, a pair of mandibles or upper jaws, two pairs of lobed maxillæ or lower jaws, three pairs of maxillipeds or mouth legs, while the name of the order *Decapoda*, is derived from the fact that there are five pairs of well-marked legs, or ten in all. The abdomen has six pairs of swimming feet or swimmerets. They carry their eggs about with them, fixed to the hairs on the peduncle of the abdominal legs, from the first to the fourth pair inclusive. Here they receive not only the protection of the parent, but also aeration by the gentle backward and forward movement of the abdominal legs. This aeration of the eggs seems to be essential to their development, for if detached from the mother they invariably die, unless the inclosed embryo has very nearly reached the point of hatching. All the eggs are not attached directly to the abdominal legs, as is the case in the common craw fish, but many of them are joined to one another by delicate threads drawn out from the secretion which invests each egg, thus forming large clusters.

Soon after the escape of the young the parent prawn casts her skin, thus ridding herself of the egg shells, which are indissolubly fastened to the legs. The casting off takes place during the night, morning discovering the newly-hatched brood at the surface of the water.

The common prawn is known to live on decaying animal matter, and probably also on small marine creatures, in which the shore abounds.

The prawn is occasionally found infected by an isopod crustacean, living in the gill cavity of its carapace, as seen in Fig. 2. No harm whatever will follow eating either boiled or raw shrimps having such a protuberance on their sides.

Fig. 1 shows the common prawn, slightly enlarged, with the parasitic bopyrus in the gill cavity under the left side of its carapace.

In Fig. 2, A is a dorsal view of the female parasitic bopyrus. *a*, cephalic lobe; *e*, epimeres. Drawn by L. C. Bossardet from life specimens. B. Ventral view of the female bopyrus. *p*, marginal, hooked legs; *o*, eggs in breeding cavity; *m*, the very small male under the abdominal lobes of the larger female. The body of the female is unsymmetric, the cause of it being parasitism. Drawn by L. C. Bossardet. C. Dorsal view of male bopyrus taken from the abdomen of the female bopyrus. Drawn by L. C. Bossardet from mounted specimens. D. Side view of male bopyrus, showing legs and gill lobes at breast. Drawn by L. C. Bossardet from alcoholic specimens.

On opening the carapace of the infected prawn we find the female of this species, which I named *Bopyrus manhattensis*, lying with its dorsal side, A, to the gills, and with its ventral side, B, to the inner side of the bulked out carapace.

The dorsal side is rather tough-skinned, of a yellowish color; is segmented, but does not show any limbs. The ventral side of the female, A, is also yellowish, with black pigmented marginal lobes, has very delicate antennæ beneath the median lobe at the broader part of its body. The legs are along the side attached to the marginal lobes; they have powerful claws like most of the parasitic crustaceans. The abdomen at its lower, more tapering end partly conceals under its gill lobes the smaller male of but 1 mm. length (see Fig. 2, C, dorsal, and D, side view). The male has a distinct head with two eyes and two antennæ, seven pair of legs, and three pair of gills, the latter being attached to the four-segmented pale abdomen, the former to the thoracic segments.

From 350 to 500 yellowish eggs are usually found in a breeding cavity on the ventral side of the female. The young look like small water fleas; and after having escaped from the mother, actively swim about in the sea, seeking new victims of prawns for their future home.

[NATURE.]

Inheritance.

The tendency in any new character or modification to reappear in the offspring at the same age at which it first appeared in the parents or in one of the parents, is of so much importance in reference to the diversified characters proper to the larvæ of many animals at successive ages, that almost any fresh instance is worth putting on record. I have given many such instances under the term of "inheritance at corresponding ages." No doubt the fact of variations being sometimes inherited at an earlier age than that at which they first appeared —a form of inheritance which has been called by some naturalists "accelerated inheritance"—is almost equally important, for, as was shown in the first edition of the "Origin of Species," all the leading facts of embryology can be explained by these two forms of inheritance, combined with the fact of many variations arising at a somewhat late stage of life. A good instance of inheritance at a

corresponding age has lately been communicated to me by Mr. J. P. Bishop, of Perry, Wyoming, N. Y., United States: The hair of a gentleman of American birth (whose name I suppress) began to turn gray when he was twenty years old, and in the course of four or five years became perfectly white. He is now seventy-five years old, and retains plenty of hair on his head. His wife had dark hair, which, at the age of seventy, was only sprinkled with gray. They had four children, all daughters, now grown to womanhood. The eldest daughter began to turn gray at about twenty, and her hair at thirty was perfectly white. A second daughter began to be gray at the same age, and her hair is now almost white. The two remaining daughters have not inherited the peculiarity. Two of the maternal aunts of the father of these children "began to turn gray at an early age, so that by middle life their hair was white." Hence the gentleman in question spoke of the change of color of his own hair as "a family peculiarity."

Mr. Bishop has also given me a case of inheritance of another kind, namely, of a peculiarity which arose, as it appears, from an injury, accompanied by a diseased state of the part. This latter fact seems to be an important element in all such cases, as I have elsewhere endeavored to show. A gentleman, when a boy, had the skin of both thumbs badly cracked from exposure to cold, combined with some skin disease. His thumbs swelled greatly, and remained in this state for a long time. When they healed they were misshapen, and the nails ever afterward were singularly narrow, short, and thick. This gentleman had four children, of whom the eldest, Sarah, had both her thumbs and nails like her father's; the third child, also a daughter, had one thumb similarly deformed. The two other children, a boy and girl, were normal. The daughter, Sarah, had four children, of whom the eldest and the third, both daughters, had their two thumbs deformed; the other two children, a boy and girl, were normal. The great-grandchildren of this gentleman were all normal. Mr. Bishop believes that the old gentleman was correct in attributing the state of his thumbs to cold aided by skin disease, as he positively asserted that his thumbs were not originally misshapen, and there was no record of any previous inherited tendency of the kind in his family. He had six brothers and sisters, who lived to have families, some of them very large families, and in none was there any trace of deformity in their thumbs.

Several more or less closely analogous cases have been recorded; but until within a recent period every one naturally felt much doubt whether the effects of a mutilation or injury were ever really inherited, as accidental coincidences would almost certainly occasionally occur. The subject, however, now wears a totally different aspect, since Dr. Brown-Séquard's famous experiments proving that guinea-pigs of the next generation were affected by operations on certain nerves. Mr. Eugène-Dupuy, of San Francisco, Cal., has likewise found, as he informs me, that with these animals "lesions of nerve trunks are almost invariably transmitted." For instance, "the effects of sections of the cervical sympathetic on the eyes are reproduced in the young, also epilepsy (as described by my eminent friend and master, Dr. Brown-Séquard) when induced by lesions of the sciatic nerve." Mr. Dupuy has communicated to me a still more remarkable case of the transmitted effects on the brain from an injury to a nerve; but I not feel at liberty to give this case, as Mr. Dupuy intends to pursue his researches, and will, as I hope, publish the results.

CHARLES DARWIN.

BREAKING OF A STEAMBOAT STEAM PIPE.

The Plymouth Rock is the name of a large and splendid summer excursion steamer plying in the vicinity of New York City, and employed this season on the route between New York and Long Branch. The vessel has a capacity of about 2,500 tons, carries 3,000 passengers, is fitted with side wheels, walking beam engine of the American river type, is 335 feet long and 80 feet wide over all, carrying heavy boilers and smokestacks that are located on the overhanging guards, one boiler on each side of the boat. The engine is of about 2,000 horse power, located in the middle of the boat. Steam is conveyed from the two boilers to the engine through two copper pipes, each of 22 inches diameter and about 30 feet long. These pipes take the steam to a vertical steam pipe, C, 12 feet in height and 31 inches diameter, furnished with a cast iron nozzle about 2 inches thick, which rests upon the upper steam chest of the engine. This part of the engine and lower portion of the steam pipe are located in the central part of the main cabin of the steamer, inclosed by glass partitions, so that the movements of the great engine, a very interesting object when in motion, may be observed by the passengers.

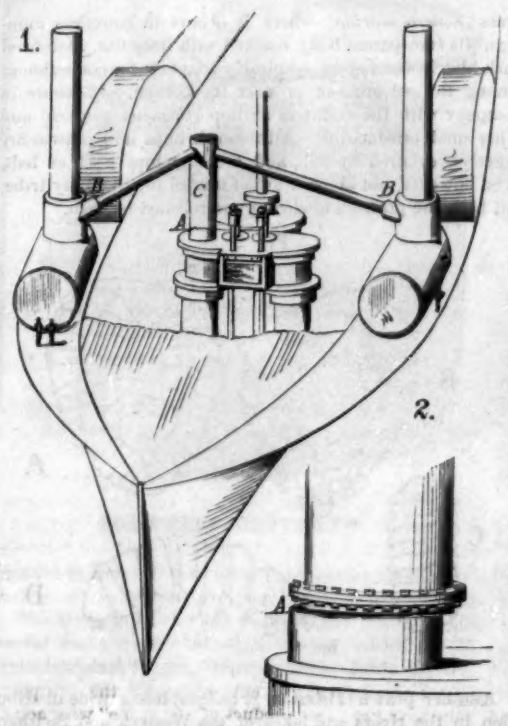
The route from New York to Long Branch is about twenty-five miles long, of which about eight miles are on the open ocean, the remainder within New York Harbor. Sometimes the boat has to meet a pretty heavy sea, and rolls about considerably. On the morning of the 17th of August, on one of her usual trips, when traveling along the ocean part of her route, a heavy sea running, and the vessel rolling, the nozzle of the main steam pipe suddenly snapped; the steam instantly filled the cabins, making a horrible noise and creating the greatest terror among the hundreds of passengers that were on board. Fortunately, however, no serious results ensued, only the engineer being slightly scalded.

We give a diagram which indicates the general arrangement of the steam pipes. The fracture took place at A.

The steam pipes are of sheet copper, except the short section just above the break, which is the chamber containing the throttle valve, of the butterfly style, similar to a stove-pipe damper.

The guards overhang some 17 feet at the point where the boilers are located, and it is obvious that the lifting effect of the waves beating against their undersides tends to tilt the tops of the boilers inward and thrust the top of the vertical pipe toward the stern of the vessel, especially when this occurs on both sides simultaneously.

To provide for this motion and for the longitudinal expansion of the pipes, slip or telescope joints are made near the boilers at B, the sliding in which is sometimes as much as an inch and a half, and so far it may have been tolerably free, but beyond this the joint might be rigid and inoperative. When the nozzle broke, a very large opening was made, the diameter of the nozzle being 31 inches. The reaction of the steam no doubt lifted the pipe and turned its lower end toward the stern, as indicated by its position after the steam



Arrangement of the Boilers and Steam Pipes of the Plymouth Rock.

had escaped, which was some three inches abaft its former place on the stump of the broken nozzle (see A, enlarged sketch) The escape of the steam, which was about 28 pounds pressure at the time (35 being the limit allowed), and the fall of the pressure in the boilers, must, according to this hypothesis, have been very rapid, as some seconds at least must have elapsed before the throttle valve could be closed. This being so we have an accidental example of the Pittsburg boiler explosion experiment on a very large and very practical scale.*

But the margin of strength above the working tension of the boilers appears to have been, in this case, sufficient to prevent injury to them, which might not have been the case if an extensive weakness had existed that was taxed almost to its limit of endurance.

Steam vessels that carry their boilers amidships are not so liable to accidents of this character, as their keels are not supposed to yield much to the action of the waves. Their steam pipes are, however, also provided with slip joints to meet what little motion there may be from this cause and from the expansion and contraction of the pipe.

The shocks to the guards of the Plymouth Rock might be greatly lessened by covering the angle that they form with the hull with properly curved planking upon stout braces. The vessel would, moreover, be much strengthened thereby in other directions.

* The recent Pittsburg experiment here referred to was fully described in the SCIENTIFIC AMERICAN, of July 9, 1881. It was made by Mr. D. T. Lawson, with a view of demonstrating that the explosion of steam boilers is often caused by the sudden release of the boiler pressure by quick opening of the valves. His theory being that when the pressure on the water in the boiler is suddenly removed, the water acts like an explosive, and flashes into steam, which exerts a pressure greatly exceeding that previously existing, whereby the boiler is torn to pieces.

AMERICAN SCIENCE ASSOCIATION.

The thirteenth convention of the American Association for the Advancement of Science began in Cincinnati, August 17, Professor G. J. Brush, of New Haven, in the chair. The venerable retiring President, Hon. Lewis H. Morgan, of Rochester, N. Y., who was kept from attendance by age and infirmities, took leave of the society in a touching letter. The members who have died since the last meeting were Leonard Carr, of Cleveland, Ohio; E. P. Darr, of Buffalo, N. Y.; George B. Emerson, Charles T. Jackson, James H. Jones, Boston; W. K. Kelzie, Oberlin, Ohio; John B. Maude, of St. Louis; Jas. A. Meigs, of Philadelphia; William Muncfiri, of Baltimore; John B. Morris, of Nashville; John Newland, of Saratoga Springs, N. Y.; G. A. Otis, of Washington; Benjamin Peirce, of Cambridge, Mass.; Samuel Watkins, of Nashville, Tenn.; Arthur W. Wheeler, of Baltimore, Md.; Samuel S. White, of Philadelphia; S. S. Haldeman, Lancaster, Pa. After the reading of the list, over two hundred new members were elected.

In the afternoon Col. Garrick Mallory, U.S.A., Chairman of the Section of Anthropology, delivered an address on "The Gesture Speech of Man." After discussing the natural origin of sign language, and the evidence of its universality and antiquity among the North American Indians, the speaker said that sign language as a product of evolution has been developed rather than invented. No signs in common use were conventional at first, however. What may appear conventions are really the different forms of abbreviations that have been adopted. Yet many of the signs that are used in gesturing are conventional in the sense that their origin is not known to those using them now. Our Indians are by no means a homogeneous race, and their signs differ as widely as their customs, religions, and word languages.

These sign words are to some extent permanent, for while they undergo development and change, as do spoken words, yet those which are general among the Indians are also found in all the other races. A comparison was then instituted between the signs of the Indians and those of the Greeks, Romans, modern Italians, Aztecs, Australians, and other peoples. The speaker then proceeded to show the archæological relation of the Indian sign language as illustrating the evolution of the race. The history and practical importance of the language were also detailed, and he then proceeded to show its relation to philology. Signs often gave words their first significance, and many primordial meanings of words are found in bodily actions. Examples were given of Indian, English, Greek, and Latin words in connection with gesture signs for the same meaning, and the structure of sign language was compared with the tongues of this Continent. Reference was also made to the old Asiatic and African languages, showing the similar operation of conditions in the same psychologic horizon. The oral language now used by man was shown to be far from "natural." There must have been an agreement between men upon the meaning given to certain sounds; hence there must have been a prior means of communication, and we may be safe in affirming that this was sign language or gestures. At least we may accept it as a clew leading out of the labyrinth of philological confusion, and regulating the immemorial quest for man's primitive language.

In the evening Capt. Dutton, of the Powell Exploring Expedition, delivered an address on "The Colorado Cañon," illustrated by numerous photographic views. This cañon is about 220 miles long, from five to twelve miles wide, and from 5,000 to 6,000 feet deep. It consists of an outer and an inner chasm, which are sometimes merged in one. A typical view in this cañon showed two lines of palisades 2,000 feet high, separated by a smooth plain five miles wide. This plain was traversed by an inner gorge descending to the river, more than 3,000 feet lower, with a width of about 3,500 feet. The region through which the cañon runs consists of carboniferous strata; but forty miles north of the river appear strata of later age, forming a series of terraces, each terrace being terminated by a line of cliffs, 1,500 to 2,000 feet high, and of very wonderful sculpture and brilliant color. The strata in this stairway of terraces are the remnants of beds which once stretched unbroken over the entire district now drained by the Grand Cañon. The total thickness of the beds removed was more than 10,000 feet, and the denuded area more than 11,000 square miles. This denudation began in the Eocene time and has been continuous until the present. A great amount of uplifting has also occurred during the same period, varying according to locality from 16,000 to 19,000 feet, and the present altitude of the region is the difference between the amount of uplift and the thickness of strata removed, that is, 7,000 to 9,000 feet. The cutting of the Grand Cañon is thus merely the closing episode of a long period of erosion. The cutting of the present chasm is a comparatively recent geological event, and probably had its beginning in Pliocene time.

The cañon was cut by the action of two natural caves. The first is the scouring action of the stream upon the rocks in its bed. The stream is a fierce torrent carrying large quantities of sharp sand, which acts like a sand blast. A river will always cut down its bed when the quantity of sediment it carries is less than it is capable of carrying. When this quantity is greater a part of it is thrown down upon its bottom, protecting it from scouring. In this respect the Colorado is an exceptional river. The other process is weathering. The stream cuts a chasm no wider than its water surface, but the cut thus made is widened by the secular decay of the walls of the chasm, which, though slow to the perceptions, becomes great after the lapse of many thousands of years. The peculiar architectural profiles were explained as being due to different degrees of resistance afforded by different beds to the action of weathering.

A Large Blast.

About the middle of June a big blast was fired in the line of a new railway at the upper end of Shell Rock, twelve miles above the Cascades, Columbia River, Oregon. Chambers had been run into the cliff from nearly opposite sides, and charged with 14,000 pounds of powder. The cliff was of basalt, projecting into the river, above which it stood at the height of about 150 feet. The extent of its base was about 200 feet, and the lateral depth of rock which it was desired to move was 75 feet to 80 feet. About 40,000 cubic yards of rock was blown off into the river.

Science of Value to All.

M. Quatrefages, in an address before the French Association for the Advancement of Science, at Bordeaux, thus emphasizes the value of scientific knowledge, not only for those who make it a specialty, but for all practical and intelligent men:

All men cannot be expected to enlist under the banner of professional science. But all may and must acquire scientific notions, sufficient at least to understand the utility of the intervention of special men, and to be able to judge when that intervention becomes necessary. Science is nowadays omnipresent, and tends more and more to become the sovereign of the world. What industry is there that does not want the help of the engineers, and would remain content with the progress already accomplished? What branch of manufactures would decline the help of chemistry? What medical practitioner, worthy of that name, would consent to forsake physiology, that complex science, the offspring of chemistry, and would do without natural philosophy any more than anatomy? What intelligent agriculturist does not understand that the problems of culture and production are essentially questions belonging to zoology, botany, geology, and chemistry? And in this great city, one of the queens of universal commerce, what merchant would deny the importance of geography?

Science is as indispensable to the military man as it is to the manufacturer, the medical practitioner, and the agriculturist. I am not going to undervalue the share that, in war, falls to inspiration and gallantry. But inspiration must be enlightened by study, and courage must be aided by weapons equal in efficiency and power to those of the enemy. No more than the agriculturist or the manufacturer can the officer master all the sciences, the help of which is necessary to his profession. He cannot be expected to solve by himself all the problems raised by his single art. It is essential that he should first ascertain these problems, and confidentially appeal to scientific men, pointing out to them the application he wants. Let us, therefore, stir up the intellect of all men. Surely, we may hope to bring to light many treasures which, for want of the opportunities which it will be our object to create, might remain buried in the darkness of ignorance.

Our task will be fulfilled only when every man exercising any influence on his neighbor, or having any amount of leisure on his hands, shall have become an enlightened friend of science; when the least among laborers shall know what principles regulate the processes and the practice of his handicraft. . . . Look at the results obtained in England by our eldest sister, the British Association. It is owing to its action that part of the population of England has undergone a transformation. The sons of fox-hunting squires are now geologists, philosophers, botanists, archæologists, etc. It is a banker who presides over the Anthropological Institute, and a brewer who is at the head of the Astronomical Society. The British Association reckons its members by thousands, and all the principal towns dispute the honor of its visits. Let us, then, begin our work with confidence; let us spare no efforts, for none shall be in vain. We know now that in the physical world there is no loss of power, no loss of matter. It is so, and even to a more absolute degree, in the moral world. Will is also a power, a power that increases and multiplies by transforming the minds of men, like a ferment. We have the will for good; let us resolutely apply it, and we shall develop the intellects and raise hearts of men by the diffusion of scientific knowledge.

A Long Sleep.

Early in February last a young man, a stranger, was discovered in what seemed to be profound sleep in the sitting room of a country tavern near Allentown, Pa. He could not be roused, and was sent to the Lehigh County Poorhouse. A small devotional book found in his pocket bore on a fly-leaf the name Johann Gyumbere, written in German script. On the opposite page was written "Saros Cometat, Post Raslavidz, Austria." It was inferred that the man was from Saros, a county in Hungary, and that his name was Gyumbere. He has since been known as the sleeping Hungarian, and his long coma or trance has attracted the attention of many physicians as well as much popular interest.

Until April 22 he had to be fed with liquid nourishment only. On that morning, the seventy-first day of his sleep, he arose from his bed, dressed himself, and sat down on a chair, staring wildly about the room. The attendant placed him in bed again, and went down after his breakfast. On his return Gyumbere was sitting up in the same chair, looking deathly pale, and with his eyes wide open. He was given something, but instead of eating freely, as usual, he seemed to have difficulty in swallowing, and ate very little.

He kept his eyes open all day and showed some signs of intelligence, but could not speak. Later he fell asleep and his attendant left him for a moment. Thereupon Gyumbere rose, locked the door, opened the window, and jumped out, falling twenty-five feet. He was found lying on the ground near a high fence, ten feet or so from the window. He was somewhat bruised, but not seriously hurt. For four days he continued to rise from his cot of his own accord, but never spoke. The physicians of the almshouse reported that during the four days of his wakefulness he was weak and feverish. His eyes were staring, but continually open. He acted like one delirious during a fever. On one occasion, when his eyes were held open, Dr. Erdman repeatedly threatened him with clinched fist, and every time he did so the patient laughed. This convinced the physician that he could see. When a flute was played in the room, Dr. Erdman noticed that the patient's feet moved in a manner that suggested dancing.

Hopes were expressed of his speedy recovery, but on April 26 he relapsed, closed his eyes, and did not open them until May 20, when he spoke, a flower having been held to his nose. Six hours after he closed his eyes again and kept them shut until late of the night of July 31, when he was roused by a Polander, who spoke to him in Slavonic. Subsequently he sat up and told his story, which confirms the report published by the *Jeffersonian*, of Charlottesville, Va., some months ago, with regard to the victim of a practical joke at that place some time last summer.

His recollection of events shows a complete gap between the time of his falling asleep in the tavern and some day about four weeks ago, when he began to realize again that he was living. He knew nothing of his fall from the window, or of an abscess which formed on his head during his sleep. Altogether the case is a curious one, and the report of the conditions and progress of it by Dr. Erdman, the almshouse physician, is likely to be of considerable interest.

Cotton-Seed Oil in Cookery.

The taste, meaning the perception of food flavors, is perhaps as arbitrary as any human predilections. It seems in some fastidious persons to equal in delicacy and promptness the finest of chemical tests, and when influenced by the imagination, arguments relating to hygienic properties and commercial considerations have no effect. Whatever, therefore, may be urged in favor of a new article of diet, in regard to economy and mechanically fulfilling the requirements of the art of cooking, its adoption will depend on the taste of the eater, or on the skill of the cook in concealing any objectionable flavor it may have.

Except pure sweet and pure sour, there are perhaps no simple flavors.

All sugars are not pure sweets, neither are all acids simply sour; they each have besides the main flavor one by which they may be distinguished.

However desirable it may be as an improvement in the art of cooking and as a means of avoiding the annoyances that attend the use of the sputtering frying-pan with its penetrating and persistent odors, the question of substituting cotton-seed oil, or any other article, for lard in cooking will be answered by each individual according to the flavor of the cooked viands, for it is more than probable that the oil and lard will differ widely in their effects on the palate.

These thoughts are prompted by the sentiment expressed by a *Tribune* correspondent, who hails the prospect of a substitute for "that product of the swine" with hopeful expressions and a declaration that "no one is afraid of vegetable oil."

It may be said also that, notwithstanding the prejudice that has lately obtained against pork products on account of trichinæ, no one need be afraid of *good* lard, and that every one will object to bad vegetable products, especially rancid oils, in cooking or as articles of food.

A Large Paving Stone.

The largest stone slab ever quarried in the United States has recently been placed before the new residence of Mr. W. H. Vanderbilt, on Fifth avenue. The stone measures 25 feet 2 inches by 15 feet, and is 8 inches thick. It weighs about 44,000 pounds. It was quarried at Barreville, Sullivan county, N. Y., and the block from which it was cut is described as perfectly level, and about 90 feet long and 19 feet in width. From this surface the block was cut out and then raised by wedges. In this instance the seam was so open that the stone was raised without difficulty, and what was unusually gratifying to the contractors was the perfectly clean and level bed below, which required comparatively little dressing. The block could have been made 35 feet in length, but the great weight would have made its transportation very risky. As it was, a great deal of difficulty was met in bringing it to this city. It was first rolled down a hill a distance of half a mile to the river bank, and then placed edgewise in a canal boat especially arranged to receive it. The canal boat brought it to the foot of West 18th street, in this city, when it was taken out by one of Delamater's floating derricks and placed upon the deck of the derrick. From 18th street the derrick was towed to the foot of West 51st street, where the stone was lifted out and placed upon two trucks built for the occasion, and capable of carrying 35 or 40 tons. Six teams of horses hauled it to its present resting place. The risk in handling such a block of stone is very great, as a sudden jar or fall would be apt to break it. It was estimated that it would cost from $5,000 to $6,000 to duplicate it.

Aside from this monster stone, the others that have already been placed in position are of no ordinary size. Nineteen blocks, including the one already described, serve to make up the entire front on Fifth avenue, between 51st and 52d streets. The others average from 12 to 13 feet in length and 15 feet in width. These large pavements are all laid upon three parallel walls of solid rock, which is something of an innovation in its way. It has usually been the custom to rest them upon beds of sand, but it is frequently the case that the sand falls away and the stone falls with it, or, failing to do so, is very apt to break. The present method was expected to do away with any possibility of breaking. Other large stones have been employed in this building, among them the step from the sidewalk at the entrance on Fifth avenue, one of the largest of its kind; it is a fine blue stone, 24 feet 2 inches in length, 3½ feet wide, and 18 inches deep.

AGRICULTURAL INVENTIONS.

Mr. William D. Lindsley, of Sterling, Kan., has patented an improved corn planter, which consists in the construction of the plow for opening a corn furrow, which plow is so formed as to cover the corn with soil raised by the point of the plow from near the bottom of the furrow, and with the mould board so shaped as to throw the upper portion of the furrow slices containing the weeds on the sides of the furrow.

An improved horse rake has been patented by Mr. John G. Thomas, of Judson, Mo. The object of this invention is to facilitate the gathering of hay and other substances for stacking and other purposes.

Mr. Stephen V. Jeffords, of Pearson, Ga., has patented an improvement in droppers for rice, cotton, and other seeds, which consists in a peculiar arrangement of very simple mechanism by means of which the dropping is effected at regular intervals.

An improved hay rake of the class in which the rake proper is attached to and supported by a wheeled frame, with handles for propelling it, has been patented by Mr. George H. Preston, of Ottawa, Ontario, Canada. The improvement consists in attaching the rake proper to the rear portion of the frame or handles, in rear of a transporting wheel, by means of braces that are pivoted to the frame, and clasps which may be adjusted in length as required to adapt the implement for convenient use by persons of different height.

Mr. Sam T. Ferguson, of Minneapolis, Minn., has patented a sulky plow which is an improvement upon the sulky plow for which Letters Patent were granted to the same inventor February 5, 1878. In that patent the plow was swung from a ball which had an elbow extension, which latter was connected by a link with the lower end of a hand lever that was operated by the driver to raise or lower the plow. The present invention consists in connecting the link to the ball by an elbow extension which has a screw connection with the link, so that the point of connection between the link and this elbow extension may be thrown closer to the center of oscillation of the ball, or further from it, so as to regulate the depth which the plow goes into the ground.

Mr. William D. Lindsley, of Sterling, Kan., has invented an improved corn-planting attachment for sulky plows. It consists in a wheel attached to the rear of a shovel plow, and provided with suitable mechanism for driving the dropping device, which is supported above the wheel

A Fatal Electric Shock.

A strange and terrible accident occurred last evening at the generating rooms of the Brush Electric Light Company on Ganson street. About 9 o'clock two young men named George Leonard Smith and Henry Kimball, in company with another young man and two girls, stepped into the station and stood looking at the machinery in motion. Smith was very inquisitive and wanted to experiment. The manager, Mr. G. Chaffe, allowed him to try a harmless experiment, which consisted in taking hold of one of the brushes attached to the commutator, in which the electricity is held until carried away over the wires, and then, taking hold of the hands of his companions, a gentle current of electricity was passed through their bodies. Smith wanted to take hold of two of the brushes, but Mr. Chaffe grabbed his arm and held him back, telling him it was sure death to touch them. The party shortly afterwards left, Mr. Chaffe telling them to get out. About a quarter past ten o'clock Smith suddenly came into the building, seemingly under the influence of liquor. He leaned over the railing which keeps outsiders at a distance from the machinery, and, before a warning word could be said, he had grabbed the first and third brushes. Mr. Chaffe saw what he was about to do and made a jump for him. His hand stuck fast to the brushes, and, giving the engineer the word to stop the engine, he took hold of Smith and endeavored to pull him from his hold. This he was unable to do, but as soon as the engine stopped Smith raised himself to his feet, and, throwing up his arms, gave a loud gasp and expired instantly.

The thing was done so quickly that those who witnessed it could scarcely believe their eyes. Smith's face had a pale bluish tint and was drawn out of shape. His hands were badly burned, and on several of the fingers the flesh was burned to the bone. Of the unfortunate man but little could be learned, save that he was formerly a scooper at the Wheeler elevator, but for the past week had been handling lumber in various yards on the island. He was about twenty-eight years of age, and in the neighborhood of five feet eight inches in height. It was stated that he has a wife and child living in the city, but where the writer was unable to ascertain. Mr. Chaffe says the generator is one of tremendous power, and would kill fifty thousand men as easily as one.—*Buffalo Courier, August* 8.

Signal Bells for Eddystone.

Two great bells have been cast at West Croydon, in England, for the tower of the new Eddystone Lighthouse. Each has a weight of about 43 cwt. and a diameter at the mouth of 5 feet 1¼ inches. Their note is C, and they are intended to act as fog signals—the one to leeward, the other to windward.

DECISIONS OF THE COURTS RELATING TO PATENTS.

United States Circuit Court—Northern District of New York.

PATENT FOLDING CHAIR.—COLLIGNON *et al. vs.* HAYES.

This is a motion for a preliminary injunction founded on letters patent No. 96,778, granted November 16, 1869, to Nicholas Collignor and Claudius O. Collignon, for an improvement in folding chairs.

Blatchford, J.:

1. PRELIMINARY INJUNCTION.—Preliminary injunction granted where it appears that the plaintiffs had been manufacturing under their patent for ten years, and had never been interfered with except by the defendant, whom they had promptly notified to cease infringing.

2. SAME—DELAY IN BRINGING SUIT.—Mere forbearance to sue, under the circumstances stated, after the notice given, cannot, in the absence of any affirmative encouragement to the defendant, be held to affect the plaintiffs' right to a preliminary injunction in such a plain case as this is.

3. SAME—IDENTITY OF DEVICES.—Where in defendant's device corresponding parts are pivoted together and fold together in like way, and by the identical mode of operation as in the plaintiffs' device, an injunction will be granted, although defendant is operating under the patent, the claims of which do not conflict with the plaintiffs' patent.

4. SAME—CLAIMS OF DEFENDANT'S PATENT NOT THE TEST.—Either claim in the defendant's patent may be valid as a whole, and yet there may be no right to make the whole structure shown in its drawings without a license under plaintiffs' patent.

United States Circuit Court.—District of Massachusetts.

PATENT SEWING MACHINE CUTTER.—BARBER *vs.* HALLETT.

Lowell, J.:

1. REISSUE NO. 7,860—CHANGE OF MOVEMENT OF CUTTING-KNIFE PATENTABLE.—Plaintiff's patent declares his invention to consist of a reciprocating knife adapted to trim the edges of leather or other stock while it is being stitched and in a line that is parallel with the stitching: *Held*, that the machine differs from prior machines organized to cut by up and down movement of various sorts, or by a drawing movement or by a rotary sawing movement, and that, in view of the evidence, there is utility in such change.

2. SAME—INFRINGEMENT.—*Held, further*, to be infringed by defendant's machine, wherein the knife has a slight up and down movement in addition to the forward movement, and moves in the arc of a circle instead of in a straight line, it appearing that most of the cutting is done during the forward movement, and that for all practical purposes the series of small arcs has the appearance of a straight line.

United States Circuit Court—District of Connecticut.

PATENT PAPER RING.—GRIFFITHS *et al. vs.* HOLMES, BOOTH & HAYDENS.

Shipman, J.:

This is a bill in equity to restrain the defendant from the infringement of reissued letters patent of September 24, 1872, to Josephine Cary and Clementine Griffiths, assignees of Harry S. Griffiths, for an improved suspension ring for business cards, so that they can be easily hung against a wall.

REISSUE NO. 5,067—ANTICIPATION.—Reissued letters patent granted to Josephine Cary and Clementine Griffiths, September 24, 1872, for an improved suspension ring for business cards, consisting of a ring of thin sheet metal having a shank or bottom piece provided with sharp spurs, which are pushed through the card and turned down on the other side, are anticipated by an umbrella-fastener consisting of a ring of sheet metal with spurs which are pushed through the India-rubber band, which serves to keep a folded umbrella in place.

The Iron and Steel Industry.

The annual report of the secretary of the American Iron and Steel Association, just published, gives the statistics for the United States as follows:

Production of pig iron in 1880, in net tons, 4,295,414; of spiegeleisen (including in pig iron), net tons, 19,603; of all rolled iron, including nails and excluding rails, net tons, 1,838,906; of Bessemer and steel rails, net tons, 954,460; of open hearth steel rails, net tons, 13,615; of iron and all other rails, net tons, 493,762. Total production of rails in 1880, net tons, 1,461,837; of iron and steel street rails, included in foregoing, net tons, 16,894; of cut nails and spikes, included in all rolled iron, kegs of 100 lb., 5,370,512; of crucible steel ingots, net tons, 72,424; of open hearth steel ingots, net tons, 112,953; of Bessemer steel ingots, net tons, 1,203,173; of blister and patented steel, net tons, 8,465; of all kinds of steel, net tons, 1,397,015; of blooms from ore and pig iron, net tons, 74,589.

Imports of iron and steel in 1880, $80,483,365; exports of iron and steel, $12,960,995; imports of iron ore, gross tons, 493,408; imports of steel blooms, net tons, 65,000. Production of Lake Superior iron ore in 1880, gross tons, 1,987,598; of anthracite coal in 1880, gross tons, 23,437,242. Production (estimated) of bituminous coal in 1880, gross tons, 43,000,000.

Wire Goggles for Snow Blindness.

A companion of Schwatka informs us that goggles of wire gauze without glass are effectual against snow blindness, and that they were largely used by the Franklin expedition, many of them having been found among the relics at burial places of the victims, and at other points in the Artic regions where remains were found supposed to belong to that unfortunate party. The glasses sometimes used, of various hues, become so fogged by the moisture from the breath of the wearer as to completely obstruct the vision, and they cannot be used in hunting. Snow blindness in the northern latitudes is a severe malady. The inner coat of the eyelids becomes inflamed, accompanied with impairment of vision and intense pain, requiring sometimes several days within doors for its cure. Nearsighted people are said to be less affected than others.

ENGINEERING INVENTIONS.

Messrs. Samuel B. Connor, Henry Dods, and William S. Ferguson, of Virginia City, Nevada, have patented an improved automatic counterbalance to spear rods of mining pumps. The invention consists in connecting the counterbalance with the spear rod by means of air or water pipes and cylinders provided with suitable plungers, whereby said counterbalance is made to co-operate with the spear rod.

Mr. Edward A. Beyer, of Negaunee, Mich., has patented an improved means for connecting and disconnecting a hoisting drum and its driving shaft, and also to a brake for checking its speed when in motion. The invention consists in combining with hinged bars nuts pivoted to their ends and a shaft carrying a right and left screw.

An improved heading, stave, and spoke sawing machine has been patented by Mr. Jesse G. Wilson, of Clayton, Ind. The object of this invention is to furnish machines for sawing logs longitudinally in the direction of their centers and to any desired depth, and which shall be so constructed that the logs can be conveniently turned and raised and lowered to bring them into proper position, and to allow one tier after another to be removed from the outer parts of the logs until the logs become too small for farther sawing.

Mr. George W. Vroman, of North Platte, Neb., has patented an improved railroad cross tie that will secure a rail firmly without the use of bolts, keys, or wedges applied directly to the rail.

An improved steam boiler cleaner has been patented by Mr. Abraham Johnson, of Young America, Ind. The invention consists in combining a tube set in the head of boiler above the water level, a stuffing box, and a removable tube passing through the first one, said removable tube having a bent end extending nearly to the bottom of boiler, and provided with a blow-off cock.

An improved interlocking switch in which the switch operating levers interlock each other, so that the switch rails cannot be moved until the signal has been given and the entire train has left the switch, has been patented by Mr. James A. Bonnell, of New York city.

An improved disinfecting and automatic flush tank has been patented by Mr. James J. Powers, of Brooklyn, N. Y. The object of this invention is to facilitate collecting and disinfecting liquid sewage and removing it after disinfection. The invention consists in a tank provided with a siphon, the inner end of which is closed by a valve on a pivoted lever, to the outer end of which a float with a vertical tubular extension is attached, whereby the float will be raised as the level of the water rises, thus closing the siphon; but when the water level has reached the upper edge of the tubular extension of the float the water will flow into the float, causing it to descend, thereby opening the siphon and permitting the water to flow from the tank, the water in the float flowing off through a small flexible tube.

American Enterprise.

Another and very remarkable exhibition of American enterprise has come to light through the publication of the Revision of the New Testament. With infinite care the Commission of Revision kept the result of their labors secret. They knew that they had American publishers to deal with and American daring and energy to encounter. With a great show of desire for absolute fairness all round they arranged it so that the proof-sheets of their labors should be given out in England simultaneously to all publishers, both British and American, ignoring the fact that by this arrangement, if it had been adopted exactly according to their old-fogy notions, the English printers would have had eight or nine days' start on their American brethren. The Appletons of New York knew a trick or two, and proceeded to put one in practice. Weeks ago they selected a perfect outfit of type and cases, likewise a perfect force of skilled compositors. Every printer could tell from the character of the work the quality and quantity of type that was needed and the force that was required to set up the matter in a week. All this knowledge was brought to bear, and both men and material were shipped to England by various steamers, so that suspicion should not be excited. Then necessary space on a fast return steamer was engaged without explanation as to the use it should be put to, and the typos were shipped as ordinary passengers. As soon as land was lost sight of, and no chance of telegraphic communication to either end of the journey was possible, the hired space was occupied, the cases were set up, and the familiar call of "Copy!" was heard issuing from the foreman's lips. One can fancy the boss calling out, "Look here, who's got that last take of the Sermon on the Mount?" and the reply, "I'm setting up Ananias, you old"—mutter, mutter, mutter.

When the steamer arrived in New York she was met by a horde of representatives of other publishing houses eager for their copy. The forms belonging to the Appletons had been stereotyped on board and the type returned to its boxes. The plates went up to the publishing house, and within twenty-four hours the perfected books were being issued to the newsdealers by the hundred thousand at a time. It no doubt cost a heap of money and much brains to conduct this skillful operation, but it will pay and pay largely. "And why," says the adroit speculators, "should not the word of God, according to the latest revision, be profitable in a temporal as well as a spiritual sense?" It is very likely that copies of the American edition will be sold in England before the sleepy British printers get the work bound.—*N. Y. Corresp. St. L. Globe Democrat.*

The Lumber Industry of Puget Sound.

None but those who have been on the ground can have an adequate conception of the extent of the lumbering business of the Puget Sound district, Washington Territory. The sound, a magnificent arm of the sea, reaches down from near the northwestern limit of the Territory nearly to its western middle, affording extended facilities of navigation, its numerous bays, like insinuating fingers, feeling into the Territory all along shore, as if inviting, and even clutching, after the commerce of the country. Around this stretch and spread of navigable waters grow the finest forests in the world, of pine, fir, spruce, and redwood, the enormous growths of which are a natural wonder. Since the settlement of the Pacific coast the lumber business of Puget Sound has been gradually developed, under the stimulus of California and Chinese trade, until it has become an industry of leading proportions. Numerous mills, of first class appointment and capacity, cluster about the indentations of the sound, many of the lumbering points constituting towns by themselves. In these towns are stores, carrying stocks of merchandise of from $40,000 to $100,000. The lumber companies own lines of ships, and frequently from four to ten vessels can be seen simultaneously loading at the dock of a single mill. Many of these mills have attached to them from twenty to fifty dwellings, and the population of a single village sometimes numbers 500 or 600 persons. A single company owns three of these immense milling establishments, with four mills capable of cutting 500,000 feet of lumber a day, together with four powerful tug-boats, a score of ships, and timber lands estimated at 200,000 acres.

The leading mills of the sound are those at Ports Gamble, Ludlow, Blakely, Madison and Discovery, Seabeck, Utsalady and Tacoma, besides which are smaller mills at New Tacoma and Seattle. The daily capacity of the larger mills, when driven, is about as follows:

	FEET.
Port Gamble	200,000
Seabeck	80,000
Discovery	70,000
Madison	100,000
Blakely	100,000
Tacoma	90,000
Utsalady	75,000
Ludlow, when completed	225,000
Total	940,000

The smaller mills about Seattle, the principal lumbering point of the district, will aggregate a daily cut of 150,000 feet, making the total diurnal product of the mills about Puget Sound nearly 1,100,000 feet. The cut of the mills during the year ending June, 1881, was 200,000,000 feet. Of the lumber product of this region 25,000,000 feet a year is shipped to foreign countries, 25,000,000 used at home, and 150,000,000 sent to California.

This great industry had its beginning thirty years ago, in a little water-power mill, erected in Thurston county, by James McAllister. The capacity of this mill was 1,000 feet per day. The first steam sawmill was erected by H. L. Yesler, in Seattle, in 1853, and had a daily capacity of 8,000 or 10,000 feet.

Great as has been the increase of the past, its volume is small compared to what may be expected in the future. The expansive and towering forests about Puget Sound are but just touched by industry, and the lumber interests of that region are yet to feel the energy of the Northern Pacific traffic. The future of the lumber business of Washington Territory can be seen as in a glass, but not darkly.—*N. W. Lumberman.*

Howard's Method of Artificial Respiration.

We think it advisable at this season, says the *Canadian Journal of Medical Science*, to direct attention to the following rules for resuscitating the partially drowned:

1. *Instantly* turn patient downward, with a large firm roll of clothing under stomach and chest. Place one of his arms under his forehead, so as to keep his mouth off the ground. Press with all your weight two or three times, for four or five seconds each time, upon patient's back, so that the water is pressed out of lungs and stomach, and drains freely out of mouth. Then,

2. *Quickly* turn patient, face upward, with roll of clothing under back, just below shoulder blades, and make the head hang back as low as possible. Place patient's hands above his head. Kneel with patient's hips between your knees, and fix your elbows firmly against your hips. Now, grasping lower part of patient's naked chest, squeeze his two sides together, pressing *gradually* forward with all your weight, for about three seconds, until your mouth is nearly over mouth of patient; then, with a push, *suddenly* jerk yourself back. Rest about three seconds; then begin again, repeating these bellows-blowing movements with perfect regularity, so that foul air may be pressed out and pure air be drawn into lungs, about eight or ten times a minute, for at least an hour, or until the patient breathes naturally.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) E. D. V. asks: 1. How can I make a blowpipe and bellows to operate with the foot that will give a constant, even stream of air at the point of blowpipe? I want it for a jeweler. A. Take two good common hand bellows. In one put a spring to throw its sides apart. Connect a spring with the other that will force its sides together. The latter will form the wind chamber. Now connect the nozzles of the two bellows together, and from the larger part of the nozzle of the wind chamber take your tube for the blow pipe. 2. You noticed some months since, with an illustration, a spider having drawn a snake up from the floor by its net. Yesterday, in my neighbor's greenhouse, I saw a large beetle (or bug) suspended two inches from the table by one leg in a spider's web. The beetle was one and a quarter inches long, four legs to hinder part and two to fore part of body. They often fall on the table and floor upon their back; and in some way a spider had fastened its web about the leg of this beetle while lying on its back, and I saw it in the act of shortening the radial weblines, by making fine marks. I could see the beetle was lifted higher at long intervals. It was one of the middle legs, and the beetle struggled in vain to free itself with its other legs. Others were called in to look at it. An interesting sight truly, and I thank you for calling attention to such spider mechanics. But for your item and illustration the instance here noted would probably have been passed by. I have forgotten to say that a vine ran along the wall just above the table, from the leaves of which the web was suspended. A. Spiders are good engineers. We have seen one of these creatures attach its lines to a large envelope, and by skillful maneuvers convey it from the top of a desk to the center of a room, the envelope being suspended from the ceiling.

(2) C. K. asks for a cheap and practical way for japanning or enameling wooden handles, such as brooms, brushes, rubber stamp, lather brush handles, etc., so as to have a hard and glossy black surface that will not get dull or tarnish by wear a reasonable length of time. A. There are several cheap japan varnishes in the market specially adapted for this kind of work. When wood has been varnished with one of these it is put into an oven and allowed to remain there at as great a heat as it will bear until the varnish has properly hardened. Sometimes the pores of the wood are stopped with a glue sizing or with one of the patent wood filling compositions before varnishing. Some kinds of work are given several coats of varnish and ovened between each to produce the requisite body and finish.

(3) D. H. E. asks: Can you tell me of any substance on which I can make an impression with a medal or any other article having letters or figures on it, and then take a cast from it of lead or type metal? A. Papier mache is used for similar purposes. Thin unsized paper moistened with water is placed over the form and beaten in with a brush; other sheets coated with paste are applied over these in a similar manner, and when the matrix is thick enough it is dried.

(4) R. B. R. asks: What will prevent the formation of the green substance commonly called "frog spittle," in a pond into which fresh water is constantly flowing? A. Keep a small quantity of lime in the stream near its entrance to the pond. Such ponds should be provided with an adjustable surface drain, a pipe taking overflow water at or very near the surface, by which means floating matters may be drawn off from time to time and the surface of the water kept clean.

(5) M. K. writes: We contemplate having a monument put up, and have heard of them being put of white bronze. What is white bronze? Is it zinc? How durable is white bronze or zinc? Will it oxidize? If it does, what color will it have after being in the weather a year or two? How thick is the metal in such monuments? A. The "white bronze" referred to is pure New Jersey zinc. When exposed to the weather the surface of the metal becomes coated with a uniform, gray film of oxide, which, under ordinary circumstances protects it for a long time from further change. The color does not change much after the first oxidation. For the other information you desire address the monument dealers.

(6) J. A. M. asks: What will remove printer's ink from the face of a lithograph? A. Benzine or turpentine.

(7) J. W. C. writes: 1. I have a wooden cell of carbon battery, and can find nothing to coat it with that will stand sulphuric or nitric acid. Can you give me a receipt for some cement or wash that I can use which is acid proof? A. We know of no available cement or wash that will resist nitric or strong sulphuric acids for any considerable length of time. Gutta percha resists dilute acids very well. It may be dissolved in good benzine, applied as a varnish, and allowed to get dry in the air. Asphaltum varnish also resists most acids in the cold very well, and is sometimes used on wooden battery cups. 2. Please give me the composition used in making the hectograph. A. See formula in article on Stencil Copying process, page 65, current volume.

(8) J. K. F. asks: 1. In what way can I gain power or lose it? My engine, at a given pressure (limited), does not give power sufficient; pressure fixed at 60 lb., engine making 85 revolutions. A. If you have boiler enough to furnish the steam, you can increase the power of the engine by increasing its speed. If you increase to 100 revolutions per minute, the power will be increased 20 per cent.

(9) E. H. B. writes: In your issue of June 18, No. 17, Notes and Queries, you state that the use of gasoline, etc., "is dangerous." As this substance is largely used, please state more fully wherein the danger lies. Is it chiefly from the explosive properties, or as much from the detrimental effect upon the health even where ventilation is good? Is coal oil dangerous as used in the oil stoves, and how, if so? A. Gasoline gives off a heavy inflammable vapor at ordinary temperatures. This vapor, when mixed with air, explodes violently when ignited. If the vessel containing it is not airtight the vapor is liable to escape and mix with air in the room. The explosion resulting from contact of such a mixture with fire has ruined many buildings and destroyed many lives. It is hardly necessary to say that such a fluid is not safe to burn from a wick, under any conditions, for either illuminating or heating purposes. The products of combustion of gasoline are not more pernicious than those of any heavily carbureted illuminating gas, but any hydrocarbon burned for heating purposes in a stove that discharges all the products of combustion into an unventilated or imperfectly ventilated room poisons the air of that room.

(10) C. H. asks: Who built the first American locomotive, the time when built, and where run? A. In 1830, a very small locomotive, built by Peter Cooper, Esq., was tried on the Baltimore and Ohio Railroad, but never engaged in any regular business on the road; in the latter part of the same year, or early in 1831, the locomotive "Best Friend," built at the West Point foundry, commenced regular service on the South Carolina railroad.

(11) W. B. C. writes: As I was riding along in my buggy, the wheels of which were 4 feet in diameter, Mr. Fly took his seat on one of the spokes just six inches from the outside of the rim and remained there while I traveled a mile. How far did the fly ride? A. Outer diameter of wheel 4 feet = 12·56 feet, circumference, one mile = 5,280 feet, and $\frac{5,280}{12 \cdot 56} = 420 \cdot 63$ revolutions in running the vehicle one mile; but the fly was located on a point 3 feet diameter = 9·424 feet circumference, then 9·424 × 420·63 = 3963·92 feet traveled by the fly around the axle, and at the same time he traveled with the vehicle 5,280 feet, and 5,280 feet + 3,963·92 feet = 9,243·92 feet, whole distance traveled by the fly.

(12) J. S. asks: How is the beverage sarsaparilla made? What are the ingredients used—I mean as it is sold in parks, taverns, etc., for drinking? A. Flavor soft water strongly with sarsaparilla sirup (see Sirups, SCIENTIFIC AMERICAN SUPPLEMENT, No. 77), and charge the liquid with carbonic acid gas under pressure.

(13) J. S. R. asks: 1. How much coal per mile is burned by an "American" locomotive drawing 5 to 7 passenger cars, at 30 miles an hour? A. It differs very much, but an average would probably be from 50 to 60 lb. 2. How much water per mile is consumed by same locomotive? A. From 350 to 500 lb. per mile. 3. About what is the average capacity of an "American" locomotive boiler—that is, how much water does it hold? A. Boilers differ so greatly that we could not give the average.

(14) "Amateur" writes: I want to get up a small engine to drive a launch 25 feet long, and to be as economical in fuel using as possible. My idea is to get up a semi-compound, small cylinder, 3½x4½ inches, large one 7x4½ inches, having a receiver inside the boiler made of a piece of tubing 4 inches in diameter, 5 inches long. I intend to cut off the steam in each cylinder after it has followed the piston one-fourth of the stroke. This would be 16 expansions. I intend to carry 100 lb. steam. The engines to be at right angles to each other. A friend suggests that I would develop just as much power in one cylinder by making it 8x4, and cutting off at ¼ stroke. This would use about the same volume of steam, but only 8 expansions. My friend claims that the friction of the extra piston, etc., would use up the difference between the 8 and 16 expansions. A. We think, for your purpose, your friend is right; the single cylinder is best. You would gain nothing by going so far as 16 expansions.

(15) S. W. writes: I am desirous of boring for drinking water, on my premises, and am in doubt concerning the propriety of the place chosen for the well. The position decided upon is about fifty feet from a stable, about one hundred feet from other outhouses, and twelve feet from the border of a grapery. This grapery border is manured every year. There was also, some twenty years ago, an old well used for garbage, about 30 feet distant, but it was closed at that time. The well is intended to be from fifty feet to sixty feet in depth, as water would not be reached sooner. The water would be pumped through a vitrified tube. Will you inform me if, with these conditions, there is danger of contamination to the water? A. Yes; get further away from contaminations. 2. I have been advised that vitrified pipe is not necessary, but that one made of hemlock would be quite as safe and desirable. Is this so? A. The vitrified pipe is to be preferred.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 2, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Air brake cut-off and relief valve, G., Jr., & H. H. Westinghouse	245,110
Air brake strainer attachment, G. Westinghouse, Jr.	245,109
Amalgamating gold and silver, process of and apparatus for, C. E. Ball	245,117
Amalgamating metals, apparatus for, A. W. Porter	245,099
Amalgamator, C. E. Ball	244,973
Amalgamator, W. R. Miller	245,100
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Carriage for mail bags, W. A. Barnes	245,119
Carrier. See Sewing machine shuttle carrier.	
Cartridge creasing machine, C. R. Shelton	244,980
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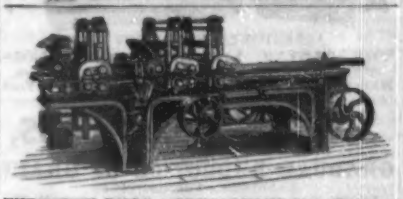

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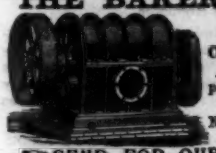

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